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ERRATA

VOLUME XXIII

page 125 line 42 for 'centipedes' read 'woodlice'
536 6 ,, ,, ,, ,,

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4 44 for '*Euthania*' read '*Euthamia*'
49 31 for 'tomato' read 'eggplant'
99 10 and 11 for '*Corticium koleroga*: *R.A.M.*, xviii, p. 451' read '*Phytophthora arecae*: *R.A.M.*, xix, p. 258'
122 40 for '*Launia*' read '*Launaea*'
193 23 for '*oxycanthae*' read '*oxyacanthae*'
206 47 for '*Muhlenbergia*' read '*Muehlenbergia*'
207 31 for '*Dydercus*' read '*Dysdercus*'
224 46 for '*Ustilago*' read '*Urocystis*'
244 47 for '*reflexus*' read '*retroflexus*'
259 40 for 'cauliflower mosaic virus [' read '[cauliflower mosaic virus:'
262 25 for 'sulphur' read 'sulphate'
265 42 for '*claviceps*' read '*clavipes*'
269 2 for '*kolleri*' read '*avenae*'
278 45 for '*Kloekera*' read '*Klockeria*'
288 41 for '*Hyoscymus*' read '*Hyoscyamus*'
330 22 for '*murarum*' read '*murorum*'
349 19 for 'blackspot' read 'blackleg'
353 21 for 'properly' read 'probably'
355 18 for '*ricini*' read '*ricinella*'
358 5 for 'R. R. Midgley' read 'A. R. Midgley'
for 'D. E. Dunkless' read 'D. E. Dunklee'
370 8 for '*Thaneda*' read '*Themeda*'
393 16 for '*R*' read '*T*'
405 45 for 'phenylalamine' read 'phenylalanine'
407 43 insert '[*R.A.M.*, ix, p. 580; x, p. 646; xxi, p. 372]' after 'winter wheat'
464 29 for 'Busby' read 'Bisby'
472 34 for 'Crandall (B. E.)' read 'Crandall (B. S.)'
488 42 for '*Pachyrrhizus*' read '*Pachyrhizus*'
520 18 for '*magninerva*' read '*magnivena*'
544 ,, ,, ,, ,,



IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
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DILLON WESTON (W. A. R.). **Chocolate spot of Beans.**—*J. Minist. Agric.*, li, 7, pp. 325–326, 1 chart, 1944.

This is a popular account of recent work on bean chocolate spot (*Botrytis cinerea*) [*R.A.M.*, xxiii, p. 467] illustrated by means of a chart.

SNYDER (W. C.). **Smudge and other fungus blemishes on Onion sets imported into California.**—*Plant Dis. Reptr*, xxvii, 23, pp. 645–647, 1943. [Mimeographed.]

Under the terms of a quarantine operating against onion smudge (*Colletotrichum circinans*) [*R.A.M.*, xxiii, p. 470] in California, a number of the carloads of sets imported annually into the State for autumn planting are rejected at their destination. However, the microscopic examination of samples from eight such consignments revealed *C. circinans* on the bulb scales of only one set of one lot of white onions, though the fungus was present in very small lesions on weathered tips of the necks of several sets in all but two lots. Symptoms simulating those of smudge were present on a number of sets from all carloads, among the fungi implicated being species of *Aspergillus*, *Macrosporium*, *Cladosporium*, *Phoma*, and *Botrytis*. It is thus apparent that the diagnosis of smudge in onion sets from other States is attended by considerable difficulty, especially in the case of brown specimens which have lost their dried tips in handling, this being the only site susceptible to infection in the coloured varieties [ibid., iii, p. 118]. The absence of smudge on California-grown onions may be due either to the efficiency of the quarantine or to the inability of the pathogen to become acclimatized to local conditions.

PORTER (R. P.). **'Arasan' (thiosan) as a Spinach seed treatment.**—*Plant Dis. Reptr*, xxvii, 14, pp. 262–263, 1943. [Mimeographed.]

After stating that arasan is identical with thiosan as regards amount and identity of the active ingredient, i.e., 50 per cent. tetramethylthiuram disulphide, and that both are equally effective as seed treatments, the author describes comparative tests conducted in the greenhouse in which spinach seed treated with zinc oxide 2 per cent., thiosan 0·4 per cent., arasan 0·4 per cent., and untreated seed was planted in soils inoculated with *Pythium* sp. or *Rhizoctonia* sp. In the *Pythium*-infected soil zinc oxide gave 27·3, 12, 73·2, and 38·5 per cent. mean emergence, thiosan 28·3, 24·2, 75·7, and 43·7 per cent., arasan (last two tests only) 76 and 49·5 per cent., and the untreated controls 3·7, 5, 52·7, and 24·5 per cent. In the *Rhizoctonia*-infected soil the corresponding figures were, for zinc oxide, 20·7, 13·5, 51·5, and 32·2 per cent., for thiosan 23·3, 23·2, 63·5, and 49·2 per cent., for arasan (last two tests only) 57·5 and 47 per cent., and for the untreated controls, 14, 8, 15·7, and 2·7 per cent.

The results so far received from co-operators in the National Spinach Seed Treatment Trials for 1943 indicate that a 0·25 per cent. dosage of arasan is adequate. In the nine significant tests so far received seven show arasan at 0·25 per cent. dosage to be as beneficial as zinc oxide at 2 per cent. The cost of treating

2,000 lb. spinach with zinc oxide (2 per cent.) plus graphite ranges from $9 to $12, as against $5. 75 to $6. 45 for arasan at 0·25 per cent. Arasan does not need graphite and contains no metal of which there is a scarcity owing to war conditions.

SHANOR (L.). **Phytophthora megasperma root rot of Spinach in North Carolina.**—*Plant Dis. Reptr*, xxviii, 9, p. 351, 1944. [Mimeographed.]

Phytophthora megasperma was isolated in February, 1944, from spinach plants affected by root rot near Wilmington, North Carolina, an area in which the pathogen had not previously been recorded. The same host was also recently attacked for the first time by *P. megasperma* in California (*Plant Dis. Reptr*, xxviii, p. 320, 1944), where the fungus, however, has been known for some years past to infect crucifers under conditions favourable for its development.

THOMPSON (R. C.). **Lettuce varieties and culture.**—*Fmrs' Bull. U.S. Dep. Agric.* 1953, 38 pp., 15 figs., 1944.

In this bulletin on lettuce-growing in the United States (superseding *Bull.* 1609) [*R.A.M.*, xx, p. 242] notes are given on the symptoms, causes, and control of the principal diseases of this crop, including damping-off [loc. cit.], tipburn [ibid., xxii, p. 512], downy mildew (*Bremia lactucae*) [ibid., xxiii, p. 470], brown blight [ibid., xx, p. 242], drop (*Sclerotinia sclerotiorum* and *S. minor*) [cf. ibid., xix, p. 512; xxi, p. 440], bottom rot (*Rhizoctonia* [*Corticium*] *solani*) [ibid., xiv, p. 73], and aster yellows [ibid., xx, p. 337].

GANS (L.). **Die Sellerie-Blattfleckenkrankheit.** [The Celery leaf spot disease.]—*Gartenbauwirtsch.*, lviii, 15, 4 pp., 1941. [Abs. in *Z. PflKrankh.*, liii, 8–12, p. 302, 1943.]

The following simplified procedure for celery leaf spot (*Septoria apii*) control has been successfully practised by the author in Bavaria for a number of years: (1) seed-steeping in ceresan or abavit; (2) sterilization of seed-beds and permanent quarters with formalin; (3) postponement of sowing until early March to avoid growth disturbances; (4) dusting before and after transplanting with a copper-containing product, such as cusisa; (5) transplanting into well-prepared soil; (6) applying potash liberally and superphosphate and ammonium sulphate in moderate amounts to the prepared planting-out beds, followed at an early date by a top-dressing of nitrophoska and potash; (7) avoidance of over-watering; (8) immediate suppression of infection foci by two treatments with a copper dust; (9) removal of diseased refuse after harvesting. The Magdeburger Markt, Rheinischer Markt, and Oberdörfer varieties are comparatively resistant.

PRESTON (D. A.) & RAY (W. W.). **Yeast spot of Soybeans and Mung Beans caused by Nematospora coryli Peglion in Oklahoma.**—*Plant Dis. Reptr*, xxvii, 22, pp. 601–602, 1943. [Mimeographed.]

Nematospora coryli was isolated from soy-bean seeds of both oil and edible varieties at the Oklahoma Agricultural Experiment Station. The symptoms of infection consist of pale cream-coloured, sunken spots on the seeds, which in severe cases remain small and become shrivelled, and a cheesy or mealy texture of the cotyledonary area involved. Similar lesions were observed on seeds distributed by the United States Department of Agriculture for regional variety tests, and studies are in progress to confirm the identity of the pathogen with *N. coryli*, which if present is evidently widespread throughout the country. The same fungus was also isolated from mung beans (*Phaseolus aureus*), apparently a new host.

LEHMAN (S. G.). **Occurrence of yeast spot on Soybean in North Carolina.**—*Plant Dis. Reptr*, xxvii, 22, p. 602, 1943. [Mimeographed.]

Nematospora (?)*phaseoli* (*N.* (?)*coryli*) was isolated between August and October, 1943, at the North Carolina Agricultural Experiment Station from a considerable number of soy-bean seeds bearing yellowish to brown areas, involving up to a quarter of one side and in cases of acute infection accompanied by extensive cotyledonary necrosis [see preceding abstract]. Some of the pods containing the diseased seeds showed small discoloured lesions, but others appeared externally sound. Shield-shaped bugs were also present in small numbers and may have introduced the fungal inoculum into the pods in the course of feeding operations. Similar observations were made on a few soy-bean pods in 1928, but the slight degree of parasitism demonstrated by inoculation tests at that time did not seem to justify the publication of a report.

DU PLESSIS (S. J.). **Swawel vir die bestryding van wingerdsiektes.** [Sulphur for the control of vineyard diseases.]—*Fmg S. Afr.*, xviii, 207, pp. 472–474, 477, 1943.

The results of experiments which have been in progress in South African vineyards since 1933 have fully established the value of sulphur in the control of *Botrytis* [*cinerea*], anthracnose [*Elsinoe ampelina*], powdery mildew (*Oidium*) [*Uncinula necator*], and leaf spot (*Isariopsis* [*fuckelii*: *R.A.M.*, xxi, p. 278]). Directions are given for the treatment of each of these diseases.

THATE (R.). **Ist die Reisigkrankheit der Rebe durch den Boden übertragbar?** [Is the Vine court-noué disease transmissible through the soil?]—*Z. PflKrankh.*, liii, 8–12, pp. 273–283, 1943.

Court-noué, an insidious decline affecting vineyards in the Ahr valley, presents a baffling problem to phytopathologists [*R.A.M.*, xxii, p. 7; cf. also ibid., xxiii, p. 326]. The author's experimental observations on the mode of spread of the disease in two localities in the late winters of 1938–9, 1939–40, and 1940–1 involved the calculation of the theoretical total volume of all new growth (using the truncated cone formula), counts of the number of internodes, double nodes, and shortened joints, the computation of the average length of the first-named, and the determination of dry weight of the wood eliminated in the spring pruning. The results were inconclusive, neither definitely supporting nor altogether contradicting the hypothesis of the movement of court-noué from diseased into healthy stands through the soil.

The outcome of experiments to determine the possible existence of root secretions in the diseased vines, both by P_H measurements of the soil in contiguous and more distant zones, and by the use of the hormone-sensitive *Saccharomyces cerevisiae* as a test organism, was entirely negative.

ANDERSON (H. W.) & COLBY (A. S.). **Dead arm disease of Grape in Illinois.**—*Plant Dis. Reptr*, xxvii, 12–13, pp. 245–246, 1943. [Mimeographed.]

Attention is drawn to an exceptionally severe outbreak of dead arm (*Cryptosporella viticola*) in Illinois vineyards in May, 1943, when the development of the pathogen was promoted by heavy and continuous rains. In the Agricultural Experiment Station vineyard at Urbana almost every vine of the majority of varieties had evidently been infected for at least four or five years, so that ordinary control measures appeared hopeless. The red to purple, elongated lesions of the fungus occurred in profusion on the new growth, and pycnidia were formed abundantly on the two- and three-year-old wood. A table is given showing the reactions to the disease of 56 varieties in 1943, of which the most resistant were

Hartford, Bacchus, Clinton, Norton, Buffalo, Yates, and Westfield; among the next 11 in order of resistance were Carman and Golden Muscat; the 20 with moderate infection included Ontario and Concord; while the susceptible and very susceptible groups comprised, respectively, 13 and 5 varieties.

CONNERS (I. L.) & SAVILE (D. B. O.). **Twenty-third Annual Report of the Canadian Plant Disease Survey, 1943.**—xviii+122 pp., 3 graphs, 1944. [Mimeographed.]

In this report [cf. *R.A.M.*, xxiii, p. 2] it is stated that during 1943, wheat stem rust (*Puccinia graminis*) was of almost no economic importance in the Prairie Provinces of Canada. Infection was rare in Manitoba and Saskatchewan in the former 'rust area', where practically no wheat susceptible to the disease is now grown. In Eastern Canada, however, stem rust appears to have been quite severe in some sections. Stem rust of oats was more prevalent than usual throughout the Prairie Provinces and was moderately abundant in the East. In Manitoba not only were susceptible varieties heavily infected, but heavily rusted spots appeared in fields of resistant varieties. It was shown experimentally that these rusted areas were due to races that hitherto have seldom been present. A heavy aecidial infection of *P. coronata* was noted on *Rhamnus cathartica* in Manitoba, the few bushes of which are situated in towns, mostly remote from oat fields. Common root rot of wheat (*Helminthosporium sativum* and *Fusarium* spp.) was found in all the 114 fields examined in Saskatchewan in 1943. Infection was slight in 17 fields, moderate in 96, and severe in one. Disease ratings were calculated for the individual fields by the examination of upwards of 100 plants from each and the mean rating for the season compared with those for 1941 and 1942. It was evident that the disease was about as prevalent and severe as in 1941, and much more severe in 1943 and 1941 than in 1942.

Browning root rot (*Pythium* spp.) was severe for the first time in many years on wheat in the heavier soils of the Regina plains and of the Rosetown area in Saskatchewan, while a severe outbreak was also recorded in one or two areas in Manitoba.

Barley black smut (*Ustilago nigra*) was again reported from Manitoba, and was found in Quebec for the first time. Nearly 40 per cent. of the samples of barley loose smut obtained from widely separated areas in Quebec proved to be *U. nigra*. This suggests that much of the loose smut in Canada could be controlled by chemical seed treatment. *Selenophoma donacis* var. *stomaticola* and *Septoria nodorum* were reported on barley from Dodsland, Saskatchewan, and Sperling, Manitoba, respectively; both are, apparently, new records for barley in Canada.

A table is given showing the results obtained in a special survey of the diseases present on material from 26 uniform rust nurseries scattered across Canada, containing wheat, oat, and barley varieties.

Seedling blight of flax (*Rhizoctonia* [*Corticium*] *solani*) was more prevalent than usual, causing much thinning of stands in Saskatchewan and Manitoba.

A study of the diseases of certain plants whose cultivation may yet be undertaken on a considerable scale in Canada showed the presence of *Coleosporium delicatulum* on *Euthania* at Ottawa, of *Puccinia hieracii* on kok-saghyz [*Taraxacum kok-saghyz*] across Canada, of [aster] yellows virus (*Callistephus* virus 1) on the same host in the Maritimes, and *Cercospora clavata*, *Uromyces asclepiadis*, and a virus disease tentatively attributed to [aster] yellows virus on milkweed (*Asclepias syriaca*) in Ontario. It was also demonstrated experimentally that *P. carthami* [ibid., xxi, p. 405; xxiii, p. 41], causing safflower rust, is a brachy-form; the presence of pycnidia was confirmed. Evidence was obtained that teleutospores on the seed infect the young crop.

The most important disease of soy-beans in south-western Ontario was blight due to *Fusarium oxysporum* f. *tracheiphilum*, followed by pod and stem blight

(*Diaporthe phaseolorum* var. *sojae*), and downy mildew (*Peronospora manshurica*). Diseases of this crop new to Canada were the leaf spots due to *Phyllosticta sojaecola*, *C. sojina*, and *Septoria glycines*. Blotch (*Helminthosporium turcicum*) of Sudan grass was another new record. Sunflowers at Ottawa showing symptoms of boron deficiency became infected by *Plasmopara halstedii*, which was exceptionally prevalent on this crop.

'Calapproved' bean seed from California gave crops free from bacterial blight (*Xanthomonas phaseoli*) and halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) when the plantings were sufficiently isolated from diseased crops. Carrot bacterial blight (*X. carotae*) is now widespread in Canada, apparently owing to the use of infected seed. Carrot yellows (*Callistephus* virus 1) [aster yellows virus] has now been reported from every province in Canada except Ontario, and will probably soon be reported from there too, as potato purple top was found there for the first time during the past season.

Vegetable diseases recorded as new to Canada included dill [*Peucedanum graveolens*] blight (*Phoma anethi*) [ibid., vii, p. 196] in Ontario, white rust (*Cystopus candidus*) of horse-radish in Quebec, blight (*Heterosporium allii*) of leek in British Columbia, and a spinach leaf spot caused by an undescribed *Cercospora* in Quebec. It is suggested that *Ramularia pastinacae* and *Cercosporella pastinacae* are phases of the same fungus causing leaf spot on parsnip.

Potato bacterial ring rot (*Corynebacterium sepedonicum*) is still prevalent in table stock in several provinces. It was found on more farms than before in southern Alberta, though the average number of diseased plants in the affected fields was smaller; in Manitoba it is an important factor in the poor quality of the potatoes; in Ontario it is not expected to spread further on the principal farms. Leaf roll was very prevalent, this disease being one of the chief difficulties in the production of certified potato seed.

Western 'X' disease of peach [ibid., xxii, p. 421] increased in prevalence in the southern Okanagan Valley, British Columbia, 'X' disease [loc. cit.] increasing slightly in Ontario. What appeared to be *Taphrina pruni* was found in British Columbia; this may prove to be the first authentic material of this fungus in Canada. An authentic record of *Phragmidium rubi-idaei* [ibid., xx, p. 596] on cultivated raspberry was obtained from Ontario. *Pucciniastrum americanum* [ibid., xx, p. 323] was serious on Viking raspberry in New Brunswick, up to 30 per cent. of the fruit being rendered unsaleable in some plantings. *Godronia cassandrae* [ibid., xv, p. 817], previously reported from Quebec, caused serious killing of blueberry bushes [*Vaccinium* sp.] in British Columbia.

Maple leaf spots (*Cylindrosporium pennsylvanicum*, *Phyllosticta minima*, *P. minutissima*, and *Phleospora aceris*) were common in eastern Canada, the last-named being a new record for Canada, while *Phyllosticta minutissima* is new for eastern Canada.

Asters at Ottawa showed heavy infection by *Basidiophora entospora* [ibid., xvi, p. 813]; *Digitalis* spp. at Ottawa were affected by *Phyllosticta digitalis*, a new record; smut (*Entyloma compositarum*) was observed on *Gaillardia* at Ottawa, a new record for eastern Canada; *Pseudomonas gardeniae* was present on *Gardenia* in Ontario, a new record; *Plasmopara viticola* caused heavy infection of *Parthenocissus* (not previously recorded on this host in Canada) and vine [ibid., xiv, p. 324] in Ontario and Quebec; *Cronartium ribicola* was found, for the first time in Manitoba, on *Ribes*, and *Ramularia lactea* occurred on pansy [*Viola tricolor*] in British Columbia, also a new record.

With reference to the earlier report of *Cercospora circumscissa* on *Prunus* spp., including *P. virginiana* and *P. serotina* [ibid., xxiii, p. 4], Dr. Chupp has pointed out (*in litt.*) that the *Cercospora* on *P. serotina* is *C. graphioides*, which is distinct from *C. circumscissa* on the other species of *Prunus*.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1943–4.—35 pp., [1944].

In the sections of this report dealing with research on fruit, tomatoes, and tobacco [cf. *R.A.M.*, xxiii, p. 164] in New Zealand during the period under review (pp. 13–25), it is stated that at Braeburn two applications of 6 lb. ground dolomite or 2 lb. magnesium carbonate applied in 1939–40 and 1940–1 have given almost complete control of magnesium deficiency on Sturmer apples. At Tasman, in an orchard where liberal potassic manuring was formerly practised, results were slower, but almost complete control was also obtained on this variety. Leaf analyses gave the following results in the 1942–3 season: at Braeburn, 0·17 per cent. magnesia on dry matter basis for the Sturmer controls as against 0·34 per cent. for the treated Sturmer trees, the corresponding figures for Jonathan apples being 0·11 and 0·17 per cent.; at Tasman, 0·23 and 0·35 per cent. for the control and treated Sturmer trees, respectively, and 0·22 and 0·28 per cent. for the control and treated Cox's Orange, respectively.

Soil treatments with steam or formalin substantially reduced tomato 'hard core' [loc. cit.]. On steamed and unsteamed soil the percentage of tomato 'cloud' [ibid., xxiii, p. 165] was 11·9 and 8·7 per cent., respectively, while on fertilized and unfertilized soils the figures were 11·8 and 10·1 per cent., respectively. Light and heavy watering reduced and greatly increased cloud, respectively.

Tobacco black root rot [*Thielaviopsis basicola*] was isolated, for the first time, from a commercial field at Dovedale. Angular leaf spot [*Pseudomonas angulata*] was identified in living and cured tobacco leaves. Inoculations of tobacco plants gave positive results with all the strains isolated. A survey of 53 typical fields in the Nelson district showed that angular leaf spot already has a fairly wide distribution in all tobacco-growing localities except the Moutere Valley and Braeburn. One case of *Verticillium* wilt [*V. albo-atrum*] in tobacco was found in Motueka.

Experiments made to ascertain the effect on the final incidence of mosaic in the field of various treatments in tobacco seed-beds confirmed the results of previous years by again indicating that bed-sown plants become less affected than pricked-out seedlings. The results also indicated that fertilizer applications at rates over ½ lb. per sq. yd. are often associated with higher percentages of mosaic when the seedlings are transplanted to the field. The lowest incidence of mosaic was associated with the fertilizer that contained no nitrogen; the highest with mixed fertilizer used at the rate of 1 lb. per sq. yd. In seed-bed tests milk sprays gave significant protection against virus infection through wounds. Both tannin and milk sprays significantly reduced mosaic in tobacco seed-beds where a number of plants had previously been inoculated with the disease. Evidence was obtained showing that the tobacco mosaic virus can persist in infected soil for four months after the incorporation of infected tobacco trash in the soil.

Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lv, 7, pp. 287–292, 7 figs., 1944.

Leaf mould (*Cladosporium fulvum*) is one of the most serious diseases that growers of glasshouse tomatoes have had to contend with in New South Wales during the past ten years. Recently, it has been prominent in several crops of outdoor tomatoes, and it appears to be increasing in importance locally. Full directions are given for the control of the disease under glasshouse conditions by regulating watering and ventilation, spraying with shirlan AG, and sulphur fumigation [*R.A.M.*, xxiii, p. 166].

Against zinc deficiency of citrus [ibid., xxii, p. 252; xxiii, p. 55] spraying with a mixture of 10 lb. zinc sulphate and 5 lb. hydrated lime per 100 gals. water in early spring once every three to five years is recommended; with deciduous fruits an application of 50 lb. zinc sulphate per 100 gals. water should be given every

year during the dormant period before bud-swell; and vines should be brushed over every year immediately after pruning with a solution of 1 lb. zinc sulphate in 1 gal. water.

Agricultural research.—*Rep. imp. Coun. agric. Res., Delhi, 1942–43*, pp. 1–9, 1943.

On p. 3 of this report [cf. *R.A.M.*, xxii, p. 381] it is stated that the Imperial Council of Agricultural Research, India, has financed a scheme for the suspension of wheat and barley cultivation in the Nilgiri and Palni hills in an attempt to ascertain whether such a step will control wheat rust [*Puccinia graminis, P. glumarum*, and *P. triticina*] in the plains of southern India [cf. ibid., xxii, p. 199]. In tests of the reaction of 143 wheats to black stem rust [*P. graminis*] one sample from the Central Provinces was resistant to all six races prevalent in India [ibid., xx, p. 292], and others from Bombay were resistant to five of them.

The Council has also sanctioned (p. 9) a scheme of research on plant virus diseases in the Bombay Province.

WILLIAMS (R. O.). **Trinidad and Tobago Administration Report of the Director of Agriculture for the year 1943.**—16 pp., 1944.

The following items occur in this report [cf. *R.A.M.*, xxiii, p. 327], apart from others already noticed from other sources.

On p. 13 C. A. THOROLD states that the campaign against cacao witches' broom [*Marasmius perniciosus*: ibid., xxiii, pp. 169, 327] in Tobago has been maintained, the cacao areas being searched and the brooms removed. This disease persists in certain localities, but in other parts little or no infection is present. Apparently, the work being done in Tobago is having some effect on the disease.

A few plots of hill rice in Trinidad were affected by a leaf spot, apparently due to a species of *Piricularia*, probably *P. grisea*, which occurs commonly on crab grass (*Digitaria sanguinalis*). No appreciable reduction in yield occurred. A survey of hill rice plots throughout the Colony revealed no widespread occurrence of this disease, but showed that *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] was prevalent, though not of economic importance.

In co-operation with Dr. E. Phillis attention was given to the recovery and utilization of the 'bottom yeast' from rum distilleries. This can be converted into a useful by-product for feeding to stock. The procedure is to collect the material left at the bottom of the vats after fermentation. It is then washed, dried, and ground to a powder which can be conveniently handled and mixed with stock feeds. This dried material consists of a mixture of yeast and calcium sulphate in about equal amounts; it may contain about 20 per cent. protein.

Report of the Agricultural Department, Dominica, 1943.—9 pp., [? 1944].

On p. 2 of this report [cf. *R.A.M.*, xix, p. 646] it is stated that during 1943 weather conditions in Dominica favoured the development of withertip of limes (*Gloeosporium limetticola*) [ibid., xix, p. 134]. An unidentified disease of vanilla, causing undeveloped flower buds and immature beans to drop, led to severe losses by some growers [cf. ibid., xx, p. 154]. The average monthly incidence of Panama disease (*Fusarium* [*oxysporum* var.] *cubense*) of bananas for all districts was 2·32 per cent. infection as against 1·49 per cent. in 1942. *Cercospora musae* [*Mycosphaerella musicola*] continues to spread [ibid., xix, p. 646].

Report on the Department of Agriculture, St. Lucia, 1943.—16 pp., 1944.

On p. 13 of this report [cf. *R.A.M.*, xviii, p. 717] it is stated that in the second half of 1943 seedling limes of different ages succumbed to the 'red-root' complex [ibid., xxii, p. 355]; only two estates, which are in the northern area, are affected,

but the losses, which have been considerable, are continuing. Sporadic outbreaks of coco-nut bud rot [*Phytophthora palmivora* or bacteria: ibid., ix, p. 90] were promptly dealt with. It was decided to discontinue control work against banana Panama disease [*Fusarium oxysporum* var. *cubense*] as from the beginning of 1944.

BIGGS (C. E. G.). **Annual Report, Department of Agriculture, Tanganyika Territory, 1943.**—8 pp., 1944.

On p. 6 of this report it is stated that during 1943 *Hemileia* disease of coffee [*H. vastatrix*: *R.A.M.*, xxi, p. 281] in Tanganyika Territory was only of mild intensity. Wheat yellow rust (*Puccinia glumarum*) was more prevalent than usual, and caused damage in the Northern and Tanga provinces. Potato late blight (*Phytophthora infestans*) [ibid., xxiii, p. 275] spread to the Usambara and Ulaguru mountains and was very destructive in many localities, though the Southern Highlands and Bukoba appear to be unaffected. *Sclerotinia* disease [*S. sclerotiorum*] occurred on various crops and flowering plants. *Ascochyta rabiei*, not before recorded in Tanganyika, caused severe loss in chickpea [*Cicer arietinum*] fields in the Lake Province.

Plant disease surveys in the northeastern United States in 1943.—*Plant Dis. Reptr, Suppl.* 147, pp. 124–229, 1 graph, 1944. [Mimeographed.]

Plant disease surveys in the southeastern United States in 1943.—*Plant Dis. Reptr, Suppl.* 148, pp. 233–302, 2 graphs, 1944.

Plant disease surveys in the western United States in 1943.—*Plant Dis. Reptr, Suppl.* 149, pp. 305–407, 3 maps, 1944. [Mimeographed.]

These supplements give a mass of detailed information concerning the prevalence of plant diseases in the United States in 1943, the data being collected for the individual states by various authors. Special articles in *Suppl.* 148 deal with 'Tobacco diseases in Kentucky' by W. D. Valleau and E. M. Johnson and with 'Diseases of soybeans and peanuts in the Carolinas' by R. E. Atkinson.

MCCLUNG (L. S.). **Early American publications relating to bacteriology. I. Text-books, monographs, addresses, etc.**—*Bact. Rev.*, viii, 2, pp. 119–160, 1944.

This partially annotated list of early American publications (1794 to 1915) on bacteriology has been compiled (with the assistance of M. L. Leikind, Library of Congress) in connexion with the project of the Committee on Archives of the Society of American Bacteriologists for the assembly of regional histories of the beginnings of bacteriology in America. It falls into two parts, one arranged alphabetically and the other chronologically.

Spore forming bacteria pathogenic to plants.—*Nature, Lond.*, cliv, 3913, p. 557, 1944.

That some spore-forming bacteria of the *Bacillus subtilis* group can be pathogenic to plants has never been generally accepted by plant pathologists, although P. Brierley [*R.A.M.*, viii, p. 195] showed that a strain of *B. mesentericus* caused rotting of potato tubers, while Madhok demonstrated that rotting of tomato fruits was produced by *B. frutodestruens* [ibid., xxiii, p. 121], a member of the same group; *B. polymyxa* has also been shown to be pathogenic to a number of plants [ibid., xxii, p. 493]. It is known that certain strains of *B. subtilis* secrete pectinases which disintegrate raw potato and are concerned in the separation of flax fibres in retting [ibid., xxiii, p. 186]. It thus appears that some spore-formers of the *B. subtilis* group and *B. polymyxa* possess the necessary enzyme apparatus to attack and destroy the middle lamella of parenchymatous tissues under certain conditions, chief of which is the presence of water.

Gibson (*J. Dairy Res.*, xiii, p. 248, 1944) has shown that this group consists of three main species, each comprising many forms hitherto given distinct specific names. Failure to repeat some of the early work on the disintegration of plant tissues by some of these bacteria may have been due to errors in identification, and the possibility that other spore-formers may possess plant-pathogenic powers requires further investigation in view of the serious losses caused by bacterial rots.

BAKER (R. E. D.) & CROWDY (S. H.). **Studies in the witches' broom disease of Cacao caused by Marasmius perniciosus Stahel. Part II. Field studies and control methods.**—*Mem. imp. Coll. trop. Agric., Trinidad*, 8, 28 pp., 7 graphs, 1944.

In this further memoir [*R.A.M.*, xxii, p. 242] the authors discuss in detail the results of three years' observations on cacao witches' broom [*Marasmius perniciosus*] made on 76 trees at River Estate, Trinidad. During the course of the work the disease rapidly became worse; under 2,000 fan-brooms were removed in 1939–40, as against 6,000 in 1940–1, and over 10,000 in 1941–2. Some of the information has already been noticed from other sources [ibid., xxiii, p. 94].

The absence of any substantial positive correlation between total leaf flush and total fan-brooms per tree per year was unexpected and suggests that other very important factors besides flush affect variation in numbers of fan-brooms, the most likely being differences in susceptibility to the production of such brooms. The strong positive correlation between the number of flowers produced and the number of cushion-brooms per tree per year suggests that this resistance can hardly be physiological but is probably a form of disease avoidance by the vegetative buds of certain trees. This is supported by the fact that fan-broom and cushion-broom production per tree are not closely correlated. Further, the brooms produced on the supposedly resistant trees are as large as those on the most susceptible trees. It, therefore, does not follow that a tree with resistance to fan-brooms will show comparable resistance to cushion-brooms or pod infection. Conversely, a tree severely attacked by fan-brooms and cushion-brooms might produce pods which by reason of some morphological character might be resistant.

Marked seasonal variation in broom formation was noted, there being a maximum in January or February, and a minimum about June or July, with fluctuating production from August to December or January. Brooms appear with the flushes, which occur five or six times a year, but the total amount of flush in a year has small effect on fan-broom production. Flowering and cushion-broom formation were ascertained to be strongly and positively correlated, an increase in flowering being followed about five weeks later by an increase in cushion-broom formation. In inoculation tests only pods under 6 cm. long could be infected [ibid., xxiii, p. 94].

Shortly before and during the period of maximum broom formation (December and January) the sporophore index is high; similarly, at the end of the dry season, when broom formation is low the sporophore index is also low; while both in 1941 and 1942 the sharp increase in the sporophore index with the first rains was followed some five weeks later by a sharp rise in broom formation. The evidence indicated that the supply of spores is of considerable importance in this disease even in heavily infested areas. Climatic and environmental factors appear to be of major importance in accounting for seasonal fluctuations in broom formation and also for regional differences in disease intensity. A study of such factors is required to complete these investigations.

It has already been shown that dormant buds cannot be infected. For infection to take place young flush must be present and after infection the young flush hardens for a period from three weeks to over three months and the first visible

sign of infection is usually the swollen pulvinus of the subtending leaf. Nothing further happens until the next flush, and if the shoot on which infection has become established misses the flush, it may dry up. True latent infections of the *Colletotrichum gloeosporioides* type do not occur. These facts explain the absence of any high correlation between fan-brooms and current flush figures.

The existence of resistant types in both Trinidad and South America appears to have been proved. For climatic reasons it is likely that in many parts of Trinidad the disease will remain relatively mild; in these areas it will probably be possible to grow high-quality susceptible strains, such as some of the I.C. selections, with success. In localities where infection is severe, all known methods of control are either ineffective or uneconomic, and the only solution is the discovery of a resistant variety.

BAKER (R. E. D.) & DALE (W. T.). **Witches' broom disease investigations. VIII. Observations on fan broom formation and loss of pods at River Estate from September 1942 to September 1943. IX. Loss of pods at River Estate. Results to April 1944.**—*Trop. Agriculture, Trin.*, xxi, 9, pp. 170–175, 175–176, 2 graphs, 1944.

In further work on cacao witches' broom [*Marasmius perniciosus*: see preceding abstract] in Trinidad, the removal of fan- and cushion-brooms from the plot of 76 trees was continued for a fourth season. During the period September, 1942, to June, 1943, and not including the early wet-season figures from July to September, no fewer than 18,034 fan-brooms were produced, as against only 10,253 for the whole of the previous season. The correlation that trees which produce many brooms one year do so again the next was once more very strong. By late 1942 and early 1943 the disease reached an intensity at River Estate comparable to that seen in Ecuador, pod infection increasing from 10 to 44 per cent., although much of the crop was set during the dry weather.

Pods have been harvested in this plot for over two years. From October, 1942, to September, 1943, 2,519 pods were removed, of which only 23 per cent. were healthy, and 44 per cent. were destroyed by witches' broom, compared with only 10 per cent. of the harvested pods destroyed by the disease from January to October, 1942.

During 1943 the percentage of diseased pods per tree ranged from 15 to 71 per cent., though the pods on all the trees appeared to be equally susceptible. In the case of fan- and cushion- broom formation, on the other hand, there was statistical evidence for resistance. Other evidence indicated that, so far, the yielding capacity of the trees is unimpaired.

No evidence of resistance to pod attack was forthcoming. Trees which set most of their crop in the dry season largely avoided infection, as pods set between mid-January and the end of April are unlikely to be attacked under the conditions locally prevailing. If a clone could be found that set its main crop at this time of the year, its use might greatly assist in the economic control of the disease, particularly if it was resistant to fan-brooms and was not a free-flowering type which would be severely damaged by cushion-brooms. Though such a clone might be found (and several I.C.S. clones show indications of behaving in this way), it would probably not produce high yields.

In contribution IX it is stated that yield records could not be maintained after April, 1944, owing to the severe trimming to which the trees were subjected in the height of the dry season, but the figures obtained showed that, as in the previous year, diseased pods are at a maximum in January and February; they also suggest that although the 1943–4 season produced a much heavier crop than the previous one, witches' broom was even more severe.

GREENWOOD (M.) [Ed.]. **Report on the Central Cocoa Research Station, Tafo, 1938–42.**—63 pp., 1 diag., 1943.

In the sections of this report dealing with cacao swollen shoot disease (pp. 44, 51, 56) [*R.A.M.*, xxiii, p. 254] in the Gold Coast it is stated, *inter alia*, that spectrographic analysis of diseased and healthy tissues and of the soils, carried out by Dr. Judd Lewis in England, showed no difference between soils from healthy and affected areas, whilst diseased shoots had a lower ash and a higher silicon content than healthy ones, and diseased chlorotic leaves a higher percentage of manganese and silicon than healthy ones. The increased percentage of these elements is attributed to premature senescence.

In tests of insect transmission by G. S. Cottrell positive results were obtained with cacao psyllid (*Mesohomotoma tessmanni*) nymphs (adults doubtful) in 6 plants out of 6 plants infested, mealy bug (*Pseudococcus* sp.) in 3 out of 3, mealy bug (*Ferrisiana* (*P.*) *virgata*) in 2 out of 5, and cacao aphis (*Toxoptera aurentis*) in 2 out of 6.

Experiments by A. F. Posnette in 1942 demonstrated that the virus passes from scion to stock within 10 days of grafting, that the first symptom is always vein-clearing in young leaves, which generally develops in 10 to 20 (minimum recorded, five) weeks after infection, depending on the incidence of flushing, that neither the number of infecting buds nor their position on the stock has any apparent influence on the time when symptoms first appear or their severity, that ring-barking at least retards the passage of the virus along the branch, and, finally, that the heat inactivation point in budwood is over 45° C. for 30 minutes and 50° for 12 minutes, the lethal points of the budwood itself.

It was established that several strains of the virus [loc. cit.] and probably more than one virus infect cacao. Double inoculations indicated that the Bisa type is a mild strain, capable of conferring some degree of immunity against the prevalent New Juaben strain. The Kpeve type does not induce immunity, and is probably a distinct virus.

Cacao deficiency diseases studied by M. Greenwood included iron chlorosis and sickle leaf mosaic. Typical symptoms of the former appeared where plant ash was incorporated in planting holes and where the lower calcareous horizons of termite mounds were brought to the surface. Spraying with 2 per cent. ferrous sulphate was temporarily effective. 'Sickle leaf mosaic', a characteristic leaf distortion and mottling, has long been associated with the presence of rotting heaps of cacao pods. It is also induced by applications of cacao ash (soluble constituents potassium carbonate and potassium phosphate). The condition was ascertained to be associated with high soil alkalinity and a high soil content of available phosphate.

JOHNSON (A. G.), LEUKEL (R. W.), & HASKELL (R. J.). **Treat seed grain.**—*Misc. Publ. U.S. Dep. Agric.* 219, 12 pp., 9 figs., 1944.

In this publication (issued 1934, revised 1944, and superseding Miscellaneous Publication 330, Minnesota Seed-Grain Treater, 1938) brief, practical directions are given for the treatment of wheat, oat, barley, flax, maize, and sorghum seed against the principal seed-borne diseases of these crops.

CHESTER (K. S.). **Low incidence of Wheat leaf rust associated with unfavorable late winter weather and antagonism of Septoria tritici.**—*Plant Dis. Reptr*, xxviii, 8, pp. 280–287, 1944. [Mimeographed.]

Examinations at ten-day intervals from the end of January to 1st April, 1944, each involving 3,000 wheat leaves, revealed no appreciable increase in the incidence of leaf [brown] rust (*Puccinia triticina*) during this critical period [*R.A.M.*, xxiii, p. 433], which in Oklahoma determines the severity of the disease for any given

season. By the latter date, on the average, one leaf in 300 bore a single rust pustule, corresponding to an incidence only $\frac{1}{30,000}$ as high as that recorded on the same date in the epidemic year of 1938. An important factor in the sparse development of the rust was the abnormally cold spell in March (mean temperature in the 28 wheat-growing counties in the western half of the State 45·8° F., compared with a 50-year average of 49°), which checked the reproduction of *P. triticina* and permitted the destruction of the rusted leaves by *Septoria tritici* as fast as new rust infections became established. However, the benefit accruing from the reduction of the rust by *S. tritici* is probably outweighed by the loss of foliage through the attacks of the latter pathogen, resulting as they do in a shortage of winter pasturage and debilitation of the plants on emergence from dormancy.

JOHNSTON (C. O.). **Weather, crop, and cereal disease conditions in Kansas.**—*Plant Dis. Reptr*, xxviii, 19, pp. 622–624, 1944. [Mimeographed.]

The cold late spring is stated to have greatly affected cereal diseases in the western Mississippi Valley in 1944. A survey of three counties east of Manhattan on 10th May revealed no traces of wheat leaf rust (*Puccinia rubigo-vera* var. *tritici*) [*P. triticina*: see preceding abstract]. By 18th May, however, the disease was present in nearly every field in eastern Kansas, extending into Nebraska, and from then on developed fairly rapidly, although, it is believed, not fast enough to cause severe damage, except possibly to late wheat in the western part of Kansas. No wheat stem rust (*P. graminis*) or any rust of oats or barley had developed by that date, but following a change of weather later in the month, both *P. graminis* and *P. coronata* were found as far north as Manhattan. Very conspicuous in the same year were also *Septoria tritici*, *Ustilago tritici*, and an unidentified bacterial leaf spot; traces were found of *Gibberella zeae* and of *Tilletia* spp.

BUCHHOLTZ (W. F.). **The Barberry and stem rust.**—*Ext. Leafl. S. Dak. agric. Exp. Sta.* 95, 2 pp., 9 figs., 4 maps, 1944.

This is an excellent popular leaflet on the barberry in relation to cereal stem rust [*Puccinia graminis*] in South Dakota.

LINDFORS (T.). **Nya försök med utrotning av Berberis.** [New experiments in *Berberis* eradication.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, viii, 5, pp. 65–69, 1944.

A cheap and effective method of barberry eradication [against wheat rust (*Puccinia graminis*)] consists in strewing dry sodium chlorate (klorex) over the soil beneath the bushes at a dosage of 300 ml. per sq. m.; used at this rate, 240 ml. suffices for a bush with a crown diameter of 1 m. In recent tests in different parts of Sweden [*R.A.M.*, xxiii, p. 171], early summer (14th June) treatments gave rather better and more rapid results than those applied in the autumn (28th October).

GLASSCOCK (H. H.) & WARE (W. M.). **Frost injury to the straw of Wheat.**—*J. Minist. Agric.*, li, 8, pp. 340–341, 1 fig. (facing p. 361), 1944.

Following severe frost in May, 1944, Vilmorin wheat growing near Wye, Kent, developed die-back of the leaves from the tip. The lowest internode or the one next to it was water-soaked and sometimes showed a brown discoloration of the tissue, while one or both of the two lowest nodes were brown. Wheat of Square-head's Master variety also showed browning of the tips of the leaf blades, but to a less conspicuous degree; the tissue of one or both of the two lowest internodes was partially collapsed, and was white or silvery, but there was no node

discoloration. This variety had lodged in patches. Other wheat crops in the same locality showed similar stem symptoms, but the dying-back of the leaf tips was less marked.

In July wheat in Kent and Sussex showed poorly filled ears and a large proportion of shrivelled grain, blackening of the ears being associated with the condition; in nearly every case, frost damage was apparent on the stem. In the authors' opinion injury by frost to the cortical tissue to such an extent as to girdle the stem, particularly in association with the drought conditions that prevailed in 1944, accounts for much of the loss of yield in wheat in south-eastern England in that year. Holdfast wheat appeared to show resistance to frost injury.

TERVET (I. W.). **Survey of the microflora of Barley seed from Minnesota, North Dakota, and South Dakota.**—*Plant Dis. Reptr*, xxviii, 14, pp. 468–476, 3 maps, 1944. [Mimeographed.]

Helminthosporium spp. predominated among the microflora of 68 lots of barley seed-grain from the 1943 harvests in Minnesota and North and South Dakota, *H. sativum* being the most prevalent, while *H. teres* was present to the extent of 17 per cent. in one lot from Renville County, North Dakota, and was not uncommon elsewhere in the northern sections of the same State and Minnesota. Other contaminants included *Fusarium*, *Alternaria*, *Aspergillus*, *Penicillium*, and *Mucor* spp., *Brachysporium* sp., and *Gibberella saubinetii* [*G. zeae*], the last-named occurring principally in the Minnesota Valley region of Minnesota and in eastern South Dakota. In isolating the fungi present the seed grain was disinfected by two minutes' immersion in 0·1 per cent. mercuric chloride and 0·3 per cent. vatsol followed by five minutes in 0·35 per cent. sodium hypochlorite and 0·3 per cent. vatsol, in order to prevent the over-running of the acid potato dextrose agar cultures by *Rhizopus nigricans* [*R. stolonifer*], which developed from many of the seeds.

SOUKHOV (K. S.). Доказательство инфекционности очищенного белкового препарата вируса мозаики Овса (закукливания Овса). [Proof of the infectivity of the purified protein preparation of the virus of Oats mosaic (zakuklivanie of Oats).]—*C. R. Acad. Sci. U.R.S.S.*, N.S., xl, 4, pp. 190–192, 1943.

The author demonstrated, at the Ufa Field Experiment Station, the infectivity of the purified protein preparation of the virus of oats mosaic [pseudo-rosette: *R.A.M.*, xxiii, p. 213] by feeding sterile larvae of the third generation of the vector, *Delphax* [*Delphacodes*] *striatella*, on a suspension of the crystalline preparation and later placing the larvae on isolated healthy oats seedlings. The 60 larvae thus treated caused infection in 18 per cent. of the plants after about one month (or 21 per cent. at the end of the experiment, a week later), while there was no infection in the control isolator containing 400 sterile larvae, and 1 per cent. in the adjacent field. An examination of a number of larvae after feeding revealed, in 7 out of 10, the presence of numerous crystals of the virus in the intestines. In the course of the experiments it was further found that the virus passes through the Seitz filter; that it remains viable after half-an-hour in a freshwater suspension of mosaic-diseased leaves; that the purified preparation remains active after seven months' storage; and that no infection results from feeding the vector on a water extract from dry mosaic-diseased leaves.

SOUKHOV (K. S.), VOVK (A. M.), & ALEXEEVA (Mme T. S.). **Purified protein preparation from the virus of Oat mosaic (zakuklivanie).**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xli, 8, pp. 344–346, 1 fig., 1943.

The extraction of the oat mosaic ('zakuklivanie') [pseudo-rosette] virus [see preceding abstract] and its precipitation with hydrochloric acid, using a method

devised by the first-named author for the purification of winter wheat mosaic [*R.A.M.*, xxii, p. 59] (*Microbiology*, Moscow, ix, 2, 1940), produced a milky-white substance composed exclusively of birefringent needle-like crystals. A suspension of the preparation was submitted to the biuretic test for protein with positive results in the shape of a clear violet ring in the test tube. The crystals can be obtained either from fresh or dry mosaic leaves. Irreversible coagulation of the protein took place in leaf fragments exposed to a temperature of 50° C. for 20 minutes or to 60° for ten.

STANTON (T. R.) & DOWN (E. E.). **Downy mildew of Oats in Michigan.**—*Plant Dis. Reptr*, xxvii, 18, p. 434, 1943. [Mimeographed.]

On 27th July, 1943, *Sclerospora macrospora* was collected on two oat selections (C.I. Nos. 3664 and 3909) from a D69 × Bond cross being grown at East Lansing, Michigan. The infected plants were 2 to 3 in. taller than healthy ones, and had contorted panicles. Oospores were abundantly present, particularly in the leaf tissues. The disease has been reported only once before in the United States [*R.A.M.*, xxi, p. 8].

HYRE (R. A.). **Cercospora zeae-maydis on Corn in eastern Tennessee and Kentucky.**—*Plant Dis. Reptr*, xxvii, 20, pp. 553–554, 1943. [Mimeographed.]

Field observations in eastern Tennessee and Kentucky from 8th to 11th September, 1943, revealed a considerable amount of leaf-spotting due to a *Cercospora*, identified by Dr. C. Chupp as *C. zeae-maydis*, a common species in South America [*R.A.M.*, xv, p. 633], but definitely recorded within the U.S.A. only from Illinois. *C. sorghi*, widespread in all the southern States, was also present to a slight extent. In Tennessee the maximum incidence of leaf spot due to *C. zeae-maydis* was 94 and in Kentucky 45 per cent., the corresponding figures for bacterial leaf blight [*Xanthomonas stewarti*] being 16 and 82 per cent., respectively.

VAHEEDUDDIN (S.). **The pathogenicity and genetics of some Sorghum smuts.**—*Tech. Bull. Minn. agric. Exp. Sta.* 154, 46 pp., 6 pl., 4 figs., 1942. [Received October, 1944.]

In this account of the author's comprehensive study of the nature and origin of the physiologic races of *Sphacelotheca sorghi* [*R.A.M.*, xviii, p. 18] it is stated that three chlamydospores were germinated from a single sorus of a Texas collection of the fungus, single sporidia isolated, and the resulting haploids crossed. One cross gave brown and the other grey heads in inoculated sorghum plants. Four crosses were made between F_1 lines, two within the brown type, and two between brown and grey. From the intrabrown and brown × grey crosses 28 chlamydospores were germinated, and segregation of factors for cultural characters and sex appeared to be independent. The Bauch test [ibid., xii, p. 88] was found to be a reliable method for determining sex in *S. sorghi*. The evidence obtained indicated the presence of multiple factors for sex and also showed that different dicaryophytes differ in pathogenicity, while multiple factors may be present for the inheritance of grey colour.

The percentage infection of sorghum with *S. sorghi* was moderately high when the seed germinated at an average soil temperature between 50° and 70° F., whereas at a lower temperature infection markedly decreased. One collection of the smut, now designated race 6, differed in pathogenicity from the five races hitherto described. A new key for the identification of all six physiologic races is provided.

Of the seed disinfectants tested new improved ceresan prevented infection entirely, while ceresan, Kopper's flotation sulphur, wettable sulphur, powdered flowers of sulphur, gas sulphur, and kolodust also gave effective control.

The Bauch test showed no reaction when haploid lines from *S. sorghi* or *S. cruenta* were mixed with haploid lines of *Sorosporium reilianum*. No sporidial fusions were noted when monosporidial lines from *Sphacelotheca sorghi* or *S. cruenta* were mixed with monosporidial lines of *Sorosporium reilianum*. There was evidence that sexual compatibility of monosporidial lines from *Sphacelotheca cruenta* and *Sorosporium reilianum* can be detected by inoculating sorghum with them. Sexually compatible lines produce chlorosis 8 to 12 days after inoculation, and chlorotic plants later develop sori containing chlamydospores. *Sphacelotheca cruenta* and *Sorosporium reilianum* are interfertile; sexually compatible monosporidial lines of these two genera, when paired, can cause infection. Different monosporidial combinations of the two genera produced sori which resembled those of *Sphacelotheca cruenta*, *Sorosporium reilianum*, *Tolyposporium filiferum*, or were very narrow and up to 7 cm. long.

The F_1 chlamydospores of the hybrid *Sphacelotheca cruenta* × *Sorosporium reilianum* are echinulate and of intermediate size, the promycelia and sporidia being significantly larger than those of the parents. The hybrid chlamydospores have a higher optimum germination temperature (30° C.) than the parents (25° and about 27°, respectively). The ratios of segregation of factors for cultural characters in the F_1 lines of the hybrid were 4 : 0, 3 : 1, 2 : 2, 1 : 2 : 1, and 1 : 1 : 1 : 1, while those for segregation of factors for sex were 2 : 2, 1 : 2 : 1, and 1 : 1 : 1 : 1. Monosporidial lines from two promycelia fell into seven sex groups when paired in all possible combinations. Variants appeared in monosporidial cultures of the hybrid which were culturally distinct from the parent colonies. Other evidence demonstrated that the hybrid is heterothallic and causes normal infection, and indicated that different combinations of sporidial lines have different degrees of pathogenicity, whereas monosporidial lines alone caused no infection.

Some of the F_2 sori produced from different combinations of F_1 lines resembled the grandparental types, while others were like *T. filiferum* or like some of the F_1 types, with very narrow, long sori. The F_2 chlamydospores are echinulate and germinate by long promycelia. Some F_2 lines on potato dextrose agar resembled haploid lines of *Sphacelotheca cruenta* and *Sorosporium reilianum*, while others resembled colonies of F_1 lines. Heterosis was evident.

Cytological studies of nuclei in the promycelia of *Sphacelotheca cruenta*, *Sorosporium reilianum*, and the hybrid gave evidence that there are four chromosomes in diploid, and two in haploid, nuclei.

MUNDKUR (B. B.). **Studies in Indian cereal smuts. VI. The smuts on Sawan (Echinochloa frumentacea).**—*Indian J. agric. Sci.*, xiii, 6, pp. 631–633, 1943.

Echinochloa frumentacea, known locally as 'sawan', 'sama', 'banti', 'sawank', or 'kuthiraivalli', is cultivated on a small scale in several parts of India, where it is eaten by the poorer classes. It also yields a valuable forage, and was exploited some years ago in the United States as a 'billion-dollar grass'.

The crop is free from important diseases except for two smuts, *Ustilago panici-frumentacei* and *U. paradoxa*, while it is also attacked by a third. According to Brefeld (1895) in ears attacked by the first-named smut not all the grains are infected. The diseased grains are twice the normal size and filled with a pulverulent mass of spherical, brownish spores 7 to 9 μ in diameter. The second smut mentioned is also ovariicolous. It, too, attacks only a few grains in an ear, but its spores are larger and perfectly smooth. Whereas the spores of *U. panici-frumentacei* germinate by the formation of a septate promycelium and lateral and terminal sporidia, those of *U. paradoxa* give out a long, branched, septate hypha without promycelium or sporidia. This fungus has been reported from Pusa, Sind, and the Bombay Province.

The third smut causes much host deformity, turning it into a twisted mass of

shoots with aborted ears. Sori occur in the inflorescence, on the nodes and young shoots, and at the axils of the older leaves. The spherical spores show thick, blunt echinulations. Butler referred this fungus to *U. panici-frumentacei*, but a comparison with the type did not bear out this identification, the spherical to slightly ellipsoidal 'Mikado brown' spores, 8·9 to 11·9 μ in diameter and with a thick epispore covered with blunt, dense echinulations or warts leaving little doubt that the fungus is actually *U. crus-galli* Tracy & Earle. The paper concludes with revised descriptions of the three organisms.

GOMEZ CLEMENTE (F.). **La 'psoriasis' o 'corteza escamosa' del Naranjo.** ['Psoriasis' or 'squamous cortex' of the Orange.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xi, pp. 97–112, 11 figs., 1942. [Received August, 1944.]

Psorosis (for which the writer prefers the designation 'psoriasis') was first observed in Spain (in the valley of Cárcer) in 1933: during the years of the civil war the disease extended its range and assumed a more severe form. At the time of writing, reports of its occurrence, mostly on Washington Navels on 'blood' orange stocks, had been received from a number of localities in Valencia, Castellón, Alicante, and Murcia. Grafting appears to be the principal means of transmission of the virus responsible for the trouble, the prophylaxis of which should therefore be based on the use of scions from healthy trees at least 15 years old, since infection may be harboured in a latent form by younger ones. Once the disease has gained ingress into a grove the only curative treatment consists in scarification of the squamous bark and the application to the exposed surface of a fungicidal paste, e.g., 2 kg. copper sulphate and 4 kg. lime in 20 l. water, 9 kg. each of sulphur and powdered lime in 16 l., or 8 l. lime-sulphur and 6 kg. lime in 14 l.

SUMMERVILLE (W. A. T.) & BLACKFORD (F. W.). **Deficiency diseases of Citrus.**—*Qd agric. J.*, lviii, 6, pp. 362–366, 2 figs., 1944.

The only citrus deficiency diseases so far associated with serious losses in Queensland are those due to lack of zinc (mottle leaf), copper (exanthema), nitrogen, and iron.

Mottle leaf can be controlled by spraying the foliage with a mixture consisting of 4 lb. zinc sulphate and 2 lb. hydrated lime in 40 gals. water [cf. *R.A.M.*, xvii, p. 170]; on slightly affected trees a half-strength mixture may be used. Application is usually made at the flush of young growth in spring in combination with a routine application of cuprous oxide. In localities where fumigation is resorted to against insects, a zinc sulphate spray in which caustic soda is used instead of hydrated lime at the rate of 4½ oz. to each lb. of zinc sulphate is recommended for combination with the copper mixture.

Under Queensland conditions exanthema seems generally to be associated with inability of the tree to absorb copper, even when an ample supply is present; faulty drainage and a hard pan near the soil surface are commonly found where this disease is present. To obtain permanent control the physical condition of the soil must first be corrected, if necessary. After this, fertilizer applications should be made, care being taken not to apply too much nitrogen, which should be supplied in light dressings at long intervals. The bunched twigs should be thinned out and the dead wood removed. Spraying with a cuprous oxide mixture (3 gals. stock solution to 40 gals. water) [ibid., xx, p. 59] effects a rapid cure. The routine sprays are sufficient for the purpose, or, if these are not applied, an application should be made in spring when the fruit has been set, and repeated later if necessary. A somewhat less satisfactory method is to sprinkle fine copper sulphate crystals on the ground under the tree at the rate of 1 to 4 lb. per tree and then chipping them in.

Against nitrogen deficiency [ibid., xx, p. 461; xxiii, p. 106] a general remedial

measure is the application of a liberal ration of nitrogenous fertilizer, but it is essential also to ensure that the soil conditions are otherwise suitable for citrus growing.

Under Queensland conditions, iron deficiency [ibid., xx, p. 461] can generally be remedied by applying up to 4 lb. sulphate of iron to the soil under each tree.

NEAL (D. C.). **Rhizoctonia leaf spot of Cotton.**—*Plant Dis. Reptr*, xxvii, 18, p. 435, 1943. [Mimeographed.]

In July, 1943, a leaf spot of mature cotton plants due to a fungus, the vegetative stages of which agreed closely with Duggar's description of *Rhizoctonia* [*Corticium*] *solani*, was found at Baton Rouge, Louisiana, this being, apparently, the first record of this fungus on the leaves of mature cotton. The symptoms appeared as light brown, irregularly shaped, interveinal spots with a dark purplish ring; as the fungus advanced, the tissues round the spots became chlorotic and the necrotic area of the old spots cracked or fell out.

PAILLOT (A.). **Sur une nouvelle mycose des chenilles de Pieris brassicae L.** [On a new mycosis of the larvae of *Pieris brassicae* L.]—*C.R. Acad. Sci., Paris*, ccxvii, 16, pp. 383–384, 1 fig., 1943.

In a planting of Saint Genis-Laval cabbages the author observed *Pieris brassicae* larvae presenting a completely abnormal aspect, the characteristic yellow and black bands having entirely disappeared except for one narrow dorso-median line, and the body being of a uniformly purplish-brown colour. The blood of the diseased insects contained large numbers of fusiform, binucleate hyphae, usually furnished with a transverse median septum and measuring 12 to 14 by 3 μ; they are reminiscent of those described by Speare in connexion with *Sorosporella uvella* (Krass.) Giard, parasitic on Noctuid larvae (*J. agric. Res.*, xviii, pp. 399–439, 1920), while some analogies with *Massospora* are also apparent. The inoculation of normal larvae with a drop of blood from an infected specimen resulted in active mycelial development and the formation of multiseptate hyphae up to 140 μ long.

The cultural characters of the fungus on various nutrient media are briefly described. A peculiar feature of the growth on oatmeal agar consists in the formation of rounded, greyish strands composed of long hyphal agglomerations; two years after plating out ten such structures were present on the surface of the medium, some of them up to 4 or 5 cm. long and much branched. Arthrospores of irregular shape were the sole form of fructification observed; they gave rise to a mycelium of a much more slender type than that occurring in the host.

CHEO (C. C.). **A study of Collybia albuminosa (Berk.) Petch, the termite-growing fungus, in its connection with Aegerita duthiei Berk. (Termitosphaeria duthiei (Berk.) Ciferri).**—*Sci. Rec.*, Chungking, 1, 1–2, pp. 243–248, 14 figs., 1942. [Received July, 1944.]

The conidia of *Collybia albuminosa*, which is widely distributed in Yunnan, China, do not germinate readily. Pure cultures may, however, be obtained from the internal tissues of the gills or stipes. At room temperature the best growth is made on 0·2 per cent. malt extract, 2 per cent. potato dextrose, and oatmeal agar, a diameter of 2 cm. being attained in two months. On potato dextrose and oatmeal agar, white, spherical, sessile bodies, 0·5 to 1 mm. in diameter, are produced either singly or, more commonly, in dense masses on the stromata. The interior of the spherical structure is composed of interlacing hyphae, swollen into chains of oblong, cylindrical, or oval cells, occasionally dichotomously branched, which on maceration break up into conidia. Similar white bodies are produced by *Aegerita duthiei* (renamed by Ciferri *Termitosphaeria duthiei* [*R.A.M.*, xv, p. 500]) in termite combs, and on transference to agar slants they develop in the

same way as the tissue cultures of *C. albuminosa*: the observed facts appear to point to a genetic connexion between *A. duthiei* and *C. albuminosa*.

It is the habit of the worker termites to transfer the spheres from one part of the comb to another, utilizing them similarly to soil particles for repair purposes; on examination the translocated globules were shown to contain dissociated conidia and mycelia.

SPROSTON (NORA G.). **Ichthyosporidium hoferi (Plehn & Mulsow, 1911), an internal fungoid parasite of the Mackerel.**—*J. mar. biol. Ass., U.K.*, xxvi, 1, pp. 72–98, 44 figs., 1944.

This is a comprehensive study of a virulent disease of mackerel in British waters, which has been causing up to 100 per cent. infection since 1940, associated with the presence in the viscera, especially the kidneys and spleen, of *Ichthyosporidium hoferi* (Plehn & Mulsow) Pettit (Entomophthoraceae) [*R.A.M.*, xiii, p. 700]. The fungus developing in the necrotic tissues may show (*a*) bunches of large, elongated chlamydospores with a very hard exospore and a thick, gelatinous endospore; (*b*) single dome-shaped conidia; (*c*) hyphal bodies of various shapes, some becoming circular and encysted and subdividing irregularly, each spherule with a separate cyst; (*d*) branched conidiophores with rounded tips containing endoconidia, liberated as minute amoeboid bodies into the blood-vessels; (*e*) simple, clavate sporangia from the ends of unbranched hyphae, also containing endoconidia; (*f*) hyphal fusions of many types immediately proceeding to further outgrowths of similar hyphae; and (*g*) fusion of two hyphae, followed by the participation of neighbouring hyphae, which also contribute to the formation of the outer resistant, rugose wall.

BRIERLEY (P.) & SMITH (F. F.). **Studies on Lily virus diseases: the necrotic-fleck complex in Lilium longiflorum.**—*Phytopathology*, xxxiv, 6, pp. 529–555, 11 figs., 1944.

Two subtypes of the necrotic fleck disease of Easter lilies (*Lilium longiflorum*) [*R.A.M.*, xix, p. 411] in the Louisiana Delta are differentiated as 'sparse fleck' and 'very sparse fleck'. The former is comparable to Ogilvie and Guterman's mosaic type B [ibid., viii, p. 578], while the latter, consisting merely of very sparsely distributed necrotic flecks, would in all probability be overlooked in the field, though perceptible in certain commercial varieties under glass; it does not detract from the saleability of the plants.

The necrotic fleck disease, a complex of the cucumber mosaic virus and a hitherto unreported virus herein designated 'lily-symptomless virus' or *Adelonosus lilii* n.g., n.sp., is mechanically transmissible to *L. longiflorum* seedlings only with difficulty (3·6 per cent. positive results), but is readily conveyed to commercial Easter lilies, e.g., Creole, Croft, and Giganteum (87 per cent. successful). The cucumber mosaic virus induces necrotic fleck symptoms in commercial Easter lilies, but not in previously virus-free *L. longiflorum* seedlings, which also responded negatively to inoculation with a mixture of the cucumber mosaic and lily mottle viruses. The latter, a common concomitant of necrotic fleck in Easter lilies, was found to be absent from plants in which the disease was experimentally induced, and cannot, therefore, in contradistinction to the lily-symptomless virus, be regarded as an essential component of the complex.

Necrotic fleck was transmitted to previously virus-free Easter lily seedlings only by *Aphis gossypii*, though positive results were also obtained with *Macrosiphum solanifolii* and *Myzus persicae* in experiments with the cucumber mosaic and lily mottle viruses. *A. gossypii* further transmitted the cucumber mosaic virus from necrotic-flecked *L. longiflorum* to *Calochortus* sp., *Colchicum autumnale*, *Gloriosa*

rothschildiana, and *Fritillaria pudica*, not hitherto recorded as susceptible to the disease.

Lily-symptomless virus is only definitely known to occur in Easter lily, though there is some doubt as to the susceptibility of the Clara Butt tulip, *C. autumnale*, and *G. rothschildiana*. It is harboured by the Norwood strain of Creole Easter lily in combination with the lily-mottle virus. Sap transfers from the host in question do not result in necrotic-fleck development in Easter lily seedlings previously infected by cucumber mosaic, but *A. gossypii* acts as a vector of the former virus to seedlings already harbouring the latter, while either sap or aphid transfers of cucumber mosaic to Norwood Creole readily synthesize necrotic fleck.

The latent period of four to six days spent by the lily-symptomless virus in *A. gossypii* serves to differentiate it from lily mottle, a fact of interest to growers who have decided on practical grounds to eradicate necrotic fleck-diseased plants while ignoring mottle. The absolutely virus-free cultivation of Easter lilies on a commercial scale is agreed to be impracticable.

THIRUMALACHAR (M. J.). **Wilting of shoots in scented Geranium (Pelargonium odoratissimum).**—*Nature, Lond.*, cliv, 3912, pp. 515–516, 2 figs., 1944.

Large numbers of *Pelargonium odoratissimum* plants in Bangalore became affected by a shoot wilt due to infection by a species of *Sphaeropsis*. When the collar region became involved the plants succumbed. The pathogenicity of the fungus was established experimentally. The intercellular mycelium was purplish-black and the glassy, hyaline, ovate to cylindrical spores measured 18 to 24 by 11 to 14 μ. In moist weather, they emerged from the long, narrow ostiole and they became brown after extrusion from the pycnidium. Later they became *Diplodia*-like, the exospore being traversed by longitudinal, hyaline streaks. The identity of the *Sphaeropsis* could not be established, but attention is drawn to *S. pelargonii* recently described on *P. zonata* in Portugal [*R.A.M.*, xvi, p. 563].

SCHANDER (H.). **Gedanken über Unterschiede und Übereinstimmungen der Chloroseerscheinungen von Lupinen und Holzgewächsen.** [Considerations on the differences and correlations in the manifestations of chlorosis in Lupins and woody plants.]—*Gartenbauwiss.*, xvii, pp. 304–309, 1943. [Abs. in *Chem. Zbl.*, cxiv (ii), 18, p. 1642, 1943.]

From his studies at the Kaiser Wilhelm Institute for Plant Breeding and the Erwin Baur Institute at Müncheberg, Mark Brandenburg, the writer concludes that juvenile chlorosis of lupins [*R.A.M.*, xv, p. 373; xvi, p. 42] is attributable to a stoppage in the transport of reserve iron from the cotyledonary leaves, which occurs when the hydrogen-ion concentration of the sap stream exceeds P_H 4·8 to 5. The P_H value is determined by (1) the acidity or alkalinity of the soil in the immediate vicinity of the roots, and (2) the capacity of the plant to regulate the hydrogen-ion concentration of its juices, the latter declining with an increase in the volume of fluid through enhanced transpiration. Typical chlorotic symptoms are absent in older plants at the optimum P_H value of 6·75. The more rapidly this point is attained, the more effectively is the critical situation in respect of chlorosis surmounted. Hence the development of the trouble is promoted by long, cold, rainy periods which retard growth. Hypothetically, similar interrelationships between soil and plant P_H values should be operative in the case of woody plants, but here experimental confirmation presents difficulties.

WEIMER (J. L.). **Some root rots and a foot rot of Lupines in the southeastern part of the United States.**—*J. agric. Res.*, lxviii, 12, pp. 441–457, 8 figs., 1944.

Investigations carried out over a period of four years have shown that root rots of lupins (*Lupinus angustifolius*, *L. luteus*, and *L. albus*) in the United States

are caused by several fungi, of which *Fusarium* spp. [*R.A.M.*, xxiii, p. 231] are considered to be the most destructive. The most frequently isolated species, responsible for most of the root rot of lupins in the south-eastern States, was a new form of *F. oxysporum*, for which the name *radicis-lupini* [with a short description] is proposed, distinct from the form *lupini*, responsible for a vascular wilt in Europe [ibid., xxii, p. 161]. The fungus was found to vary considerably in its pathogenicity, producing 44·3 per cent. infection in *L. albus*, 60 per cent. in *L. luteus*, and 65·8 per cent. in *L. angustifolius*; it appeared very sensitive to environmental conditions, causing in some years and localities great destruction while in others the disease was of little economic importance. The symptoms produced and the rate of spread through the plant tissues varied greatly in both naturally and artificially infected plants. In the field, infected plants may be killed in the seedling stage or later in the season, but some may mature seed and appear entirely normal until the plants are pulled and the decaying roots exposed. Wilting and dwarfing do not usually become conspicuous until the hypocotyl or root system is badly decayed. The colouring of the decaying tissue also varies greatly from light to darkest shades of red or brown. *F. moniliforme* [*Gibberella fujikuroi*] was isolated repeatedly and proved pathogenic to all three host species, producing cankers on the hypocotyls, but it is not considered responsible for any large proportion of root-rotting of lupins in the field. It might, however, under conditions favourable for rapid development cause considerable damage. The lesions produced by this species under experimental conditions were straw-coloured and not very deep, but otherwise similar to those caused by other *F.* spp. *F. solani* f. *lupini* n.f. [with a short description], isolated from a single plant of *L. angustifolius*, proved to be pathogenic to all three host species, spreading more rapidly and producing darker lesions than *F. oxysporum* f. *radicis-lupini*. *F. solani* f. *pisi*, isolated from a pea plant, proved pathogenic to *L. luteus* and *L. angustifolius*.

Rhizoctonia [*Corticium*] *solani* [loc. cit.] was found occasionally in association with *Fusarium* root rot in the field. Inoculation experiments showed that this fungus is capable of causing considerable damage to young lupin plants, but not to old ones, except, possibly, under extremely favourable conditions. No species of *Pythium* [loc. cit.] was isolated from naturally infected lupin roots, but *P. graminicola* was proved experimentally to be pathogenic to *L. albus* and, to a very slight degree, to *L. luteus*.

A foot rot due to *Sclerotium rolfsii* is stated to be, next to the root rots, the most common and destructive disease of lupins studied. The plants are attacked near the surface of the soil, the developing lesion gradually girdling the stem, with subsequent stunting and later wilting and death of the plant. Young seedlings may be killed within a few days, but older plants succumb more slowly. Usually only isolated or small patches were observed to be affected in the field, but the total percentage of plants lost in a small patch at times may be high.

Louw (A. J.). **The control of fungus diseases in the orchard.**—*Fmg S. Afr.*, xviii, 207, pp. 450–454, 2 figs., 1943.

Directions are given for the control of apple, pear, and stone fruit diseases in the winter rainfall area of South Africa, with special reference to the adaptation of the spraying programme to prevailing climatic and soil conditions.

Lindner (R. C.) & Harley (C. P.). **Nutrient interrelations in lime-induced chlorosis.**—*Plant Physiol.*, xix, 3, pp. 420–439, 1944.

This tabulated account of the writers' exploratory studies at Wenatchee, Washington, on lime-induced chlorosis, mostly in fruit trees, is supplemented by a discussion of the problem in the light of contemporary researches, many of which have been noticed from time to time in this *Review*.

The foliage of trees affected by the disorder tends to be high in potassium, but rather low in calcium and magnesium. Data are presented on the distribution of calcium, potassium, magnesium, phosphorus, iron, and manganese in various fractions of green and chlorotic leaves of Delicious apple and Bartlett pear, and of green and genetically variegated *Spiraea* sp. Potassium was found to be mostly water-soluble, magnesium and manganese either water-soluble or readily dissociated by 0·1 N hydrochloric acid, while calcium, phosphorus, and iron were more uniformly distributed in all the fractions. More than half the last-named mineral was present in a form insoluble in 1 N hydrochloric acid, presumably as complex organic compounds, such as iron haematin or iron-nucleoprotein. No correlation could be established between the total iron, electro-dialysable iron, insoluble iron or iron soluble in water, ether, alcohol, 1 N acetic acid, 1 N ammonium hydroxide, or 0·1 or 1 N hydrochloric acid and the development of lime-induced chlorosis, which is probably brought about by a complex of interrelated factors, not as yet fully understood. The data at hand suggest that a relatively high potassium level induces chlorosis by replacing the iron in the enzyme responsible for chlorophyll formation, thereby inactivating the latter.

TYLER (L. J.). **Apple storage diseases in New York.**—*Plant Dis. Reptr*, xxviii, 8, pp. 298–311, 1944. [Mimeographed.]

From this tabulated survey of observations made between 7th February and 25th March, 1944, in 40 cold-storage warehouses distributed over the three main apple-growing areas of New York State, it appears that surface moulds (mostly *Penicillium* spp.) were generally more troublesome in overhead-coil than in blower-type plants. Ozonization [*R.A.M.*, xxi, p. 209] eliminated moulds of this type almost completely, while formaldehyde and lime-sulphur were also effective in their suppression. On the whole, however, strict sanitation was not widely practised, excessive humidity, for instance, being prevalent in overhead-coil storages. Only 3 per cent. of the 300 apple lots examined were enveloped in oiled wrappers or shredded oiled paper as a precaution against scald [ibid., xxi, p. 457; xxii, p. 212]. Besides this and other physiological disorders, sixteen fungal pathogens were noted in the various lots, and the incidence of these diseases in cold stores with overhead coils and blowers tabulated.

A disease of the Northern spy variety, herein termed Spy spot, was found in all parts of New York State, where it has been present for several years, and was also noted on fruit from Pennsylvania, Vermont, and Massachusetts. The disease is characterized by circular to ovate, brown, sharply sunken lesions from a pencil-point dot to more than $\frac{1}{8}$ in. in diameter, usually found on the stem end and sides of the fruit in numbers up to 100 or more lesions per fruit. Of the different lots of Spys examined, 65 per cent. manifested the disease.

ENGLISH (H.). **Notes on Apple rots in Washington.**—*Plant Dis. Reptr*, xxviii, 19, pp. 610–622, 2 diags., 1944. [Mimeographed.]

From tabulated data collected between 1939 and 1943 from inspection certificates on the incidence of decay in Delicious and Winesap apples held in cold storage in Wenatchee and Leavenworth, Washington, and from precipitation records, the author concludes that the critical precipitation from the standpoint of fungous decay is principally that which occurs during the actual harvest period. Rain and water from melting snow may favour fruit infection by (1) carrying conidia of the bull's-eye rot fungus (*Neofabraea perennans*) [*R.A.M.*, xxii, p. 29] and possibly others from the branches to unpicked fruits or apples stacked beneath the trees; (2) promoting sporulation and germination of the fruit-rotting fungi; (3) favouring arsenic injury; (4) retarding the healing of wounds and the closing

of lenticels; and (5) delaying picking beyond the optimum date. Winesap apples from the Leavenworth district late in the storage season showed twice as much decay as the same variety from Wenatchee. Blue mould rot (mostly *Penicillium expansum*) [ibid., xxii, p. 100] again predominated in both districts and *N. perennans* was also important.

Experimental apples harvested under favourable conditions and promptly cooled to 31° to 32° F. developed very little decay even when stored until May. The chief points of infection with blue mould were punctures, lenticels, and the calyx basin; and with bull's-eye rot lenticels, followed in decreasing order by calyces, punctures, worm injuries, and cracks adjacent to the stem. The latter disease rarely occurs in cold storage prior to January, but once it has appeared it acts rapidly and disastrously. Other rots identified were caused by *Phialophora malorum*, grey mould (*Botrytis cinerea*), *Alternaria mali*, *Cladosporium herbarum*, *Hormodendrum cladosporioides*, *Stemphylium congestum*, *Pleospora fructicola*, and fungi of the *Pullularia-Dematium* type, but none of these appear to cause serious losses. A fungus tentatively identified as *Dendrophoma* sp. was isolated from core rots and lesions surrounding insect stings; a species of *Sphaeropsis*, markedly different from *S. malorum*, from completely rotted apples; and a species of *Trichoderma* from a rot of Jonathan apples. The pathogenicity of these three species was proved in inoculation experiments.

SCHMIDT (M.). **Untersuchungen über die Biologie von Venturia inaequalis im Zusammenhang mit der Züchtung schorfwiderstandsfähiger Apfelsorten.** [Studies on the biology of *Venturia inaequalis* in connexion with the breeding of scab-resistant Apple varieties.]—*Forschungsdienst, Sonderh.* 16, pp. 498–506, 1942. [Abs. in *Gartenbauwiss.* (Ref.), xviii, 1, pp. 19–20, 1943.]

The available information concerning the most important aspects of the biology of apple scab (*Venturia inaequalis*) and its relation to its host is summarized [*R.A.M.*, xxi, p. 23]. Monoconidial and mono-ascospore cultures of the fungus, obtained by special methods directed towards the retention of full pathogenicity, revealed the existence of a multiplicity of forms differing mutually both in physiological and morphological characters. Such forms, many of which may colonize a single tree irrespective of local and seasonal conditions, are genotypically stable and represent distinct races, as was proved by hybridization experiments. Physiologic specialization in *V. inaequalis* is conditioned by the interplay of a number of mendelian, probably polymerous genes. The occurrence of mutations was frequently observed.

The breeding of scab-resistant apples is further complicated by differing varietal reactions to the individual physiologic races, but Antonowka, Ernst Bosch, and their progeny withstood infection by a number of the latter and were barely attacked in the orchard. The above-mentioned hybridization tests showed this specific capacity for parasitization to be also genotypic. In conclusion, a defensive reaction in the host tissues of resistant varieties was demonstrated by histological methods.

WALLACE (T.), OGILVIE (L.), & SWARBRICK (T.). **Two virus diseases of tree fruits.** —*Gdnrs' Chron.*, Ser. 3, cxvi, 3016, pp. 140–141, 2 figs., 1944.

Notes are given on the occurrence in England of the American virus diseases pear stony pit [*R.A.M.*, xxii, p. 213] and apple mosaic [ibid., xxii, p. 438], both of which have been transmitted by grafting at Long Ashton.

Pear stony pit is characterized by distorted, dimpled, deeply pitted fruits. The pits are irregularly shaped and show masses of stone cells at the base, which is deep green, in contrast with the more raised portions, which are rather pale. Size

is frequently much restricted, and the fruits often fall prematurely. Cut across, severely affected fruits show internal brown, stony areas. The fruits are mostly uneatable. Leaf and bark symptoms have not been observed in England. In the authors' experience, the most commonly affected variety is Doyenné du Comice, but the condition has also been noted on Pitmaston Duchess (severely), Durondeau (severely), Beurré Bedford, and Laxton's Superb. Injections of boron and iron into Comice and Pitmaston Duchess trees had no effect.

Grafts from affected Doyenné du Comice and Pitmaston Duchess trees on healthy Pitmaston Duchess gave stony fruits on the grafts, and, in the second season, on the originally healthy parts. After four years, the crops consisted mainly of stony fruits, though the ungrafted adjacent controls were normal. Grafts of one of these infected Pitmaston Duchess trees were placed on Doyenné du Comice trees and the following year the fruits on the grafts were stony, showing the disease had been carried over by grafting on to a second crop of trees.

In 1942, Lord Lambourne apple trees growing in Worcestershire showed a mosaic-like, irregular, yellowish to creamy-white leaf mottle. Scions grafted on to a healthy tree at Long Ashton gave rise to typically infected leaves. The condition is identical with apple mosaic as found in Canada and the United States.

Control of both conditions should be possible by eliminating affected trees and using grafts and buds from healthy trees only. Nurserymen should take every precaution regarding the source of scion material of susceptible varieties.

In recent years, two peculiar conditions affecting Lord Lambourne trees and characterized by 'chat' fruits and 'rubbery' wood have appeared in England, under conditions suggesting graft transmissibility. Conditions apparently identical with false sting [loc. cit.] (on the cider variety, Sweet Alford) and flat limb [loc. cit.] (very severe, on Lord Lambourne) have also been noted.

OVERHOLSER (E. L.), OVERLEY (F. L.), & ALLMENDINGER (D. F.). **Pear growing and handling in Washington.**—*Pop. Bull. Wash. agric. Exp. Sta.* 174, 84 pp., 21 figs., 1944.

In the section of this bulletin dealing with pear diseases (pp. 72–80), brief, popular notes are given on the symptoms and control of the principal parasitic, virus, and non-parasitic diseases affecting this crop in the western United States. Cottony cork of the Beurré d'Anjou variety is a relatively new disease. An internal fruit spot which appears as the pears mature, it originates near the stem end in the form of white, spongy areas. When affected fruits are cut open, only the healthy tissue develops rapid browning. This is a reliable diagnostic symptom.

BARNETT (H. L.) & BODINE (E. W.). **Results of the brown rot survey, and notes on some other diseases of stone fruits in central California.**—*Plant Dis. Reptr*, xxviii, 6, pp. 181–183, 1944. [Mimeographed.]

During 1943, isolations from mummified fruits and twig infections in stone fruit orchards in central California, using for identification purposes the cultural characters of *Sclerotinia fructicola* and *S. laxa* described by Hewitt and Leach [*R.A.M.*, xviii, p. 533], showed that twigs of almond, apricot, peach, prune, plum, and *Prunus besseyi* yielded only *S. laxa*; in areas where peach is the dominant fruit grown, mummies yielded chiefly *S. fructicola*, whereas apricot, plum, and prune mummies yielded only *S. laxa*, except for one apricot and four prune mummies. Six isolations of *S. laxa* were made from nectarine mummies from two orchards in Contra Costa county.

Tranzschelia [*Puccinia*] *pruni-spinosae* was observed on green leaves remaining on almond trees in Monterey county in December, 1943, but when the orchards were revisited in February, 1944, no green leaves remained.

WORMALD (H.). **Strawberry leaf blotch fungus.**—*Gdnrs' Chron.*, Ser. 3, cxvi, 3018, pp. 160–161, 1944.

In the author's account of strawberry leaf blotch in Great Britain [*R.A.M.*, xxi, p. 86], the fungus was referred to as *Phyllosticta grandimaculans* Bubák & Krieger, 1912, but he now points out that in 1908 Laibach described what is undoubtedly the same organism as *Zythia fragariae* [ibid., xxii, pp. 32, 374]. It is now generally agreed that the fungus associated with the disease in England is a *Zythia*, from the colour of the fructifications, which are brownish (pale and yellowish in culture), and from the waxy consistency of the fruit body, and the conidial stage should therefore be called *Z. fragariae*.

In Britain, leaf blotch appears to have been first observed in November, 1931, on seedling strawberries at Long Ashton, though a fungus believed to be identical with *Z. fragariae* had been found on strawberry plants from Hereford in July of that year. The disease was next found in Kent, in 1939, while in 1942 it occurred in Worcestershire on the Huxley variety, adjacent Western Queen plants being unaffected. In July, 1944, infected Royal Sovereign leaves were received from Carnarvonshire, and in September of the same year leaves bearing the fungus were received from Hampshire and Norfolk. The disease has thus occurred so far in six counties of England and Wales.

When the fungus was grown in pure culture the *Zythia* stage appeared regularly, but in March, 1944, black, spherical perithecia with long necks developed in one culture tube. The ascospores measured about 10 to 12 by 2 μ and the fungus was found to be a *Gnomonia*. Later both conidial and perithecial forms developed in cultures from conidia and ascospores. In the present year both forms have been found on artificially infected leaves, from which the long neck protrudes like a brown or black bristle.

The perfect stage is very near to, and possibly identical with, *G. herbicola* described by Miss A. Lorrain Smith on the base of living stems of *Epilobium hirsutum* found in Derbyshire in 1908 and 1909. It is possible, therefore, that the strawberry fungus has other hosts. On strawberry and *Potentilla reptans* the fungus has been shown to be definitely parasitic. The disease is most common on the Royal Sovereign variety but has also occurred on Huxley's Giant.

BENLLOCH (M.). **Observaciones sobre algunas enfermedades del Olivo.** [Observations on some Olive diseases.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xi, pp. 1–12, 8 figs., 1942. [Received August, 1944.]

Attention is drawn to the striking discrepancy between the symptoms induced by *Cycloconium oleaginum* on two olive varieties in Spain [*R.A.M.*, xxi, p. 403], viz., Nevadilla de Martos in Córdoba and Verdial in Málaga, much heavier damage being sustained in the former locality than in the latter, although the lesions on the foliage are considerably larger on Verdial than on Nevadilla. This apparent anomaly is attributed to differences in the climate of the two provinces.

Parasitic leaf 'scorch' was found to be associated with infection by *Macrophoma oleae* in one locality in Córdoba and with *Septoria oleae* in another. While this paper was going to press, a leaf sample from Posadas, in the same province, revealed the presence of *Stictis panizzei*, the most virulent agent of the disease in Italy [ibid., xvi, p. 546], which had not hitherto been detected in Spanish olive groves.

Generally speaking, *Gloeosporium olivarum* does not assume such a severe form in Spain as in Portugal [ibid., xxi, p. 496], but it may cause appreciable losses in a rainy autumn on late varieties. The extensive spread of 'knot' (*Bacterium* [*Pseudomonas*] *savastanoi*) is believed to be largely due to the use of apparently healthy but actually infected scions for grafting; growers should realize that the

pathogen may be harboured by any part of a diseased tree, not merely by the tumours themselves.

McNew (G. L.). **The use of fungicides during war.**—63 pp., 30 figs., 3 graphs, Chicago, The Canner Publishing Company, [1944].

This is a reprint of thirteen articles published by the author in *The Canner* during 1943 [cf. *R.A.M.*, xxii, p. 338], with the addition of a foreword, a seed treatment chart for vegetables, and a descriptive list of the fungicides discussed.

Officially approved insecticides and fungicides.—*J. Minist. Agric.*, li, 8, pp. 383–384, 1944.

A list is given of proprietary products officially approved for the control of plant pests and diseases and now added to the list previously published [*R.A.M.*, xxiii, p. 237].

Townsend (G. R.) & Heuberger (J. W.). **Methods for estimating losses caused by diseases in fungicide experiments.**—*Plant Dis. Reptr*, xxvii, 17, pp. 340–343, 1943. [Mimeographed.]

In estimating the effects of new fungicides against celery early blight (*Cercospora apii*) two methods of estimating the amount of disease present were compared, viz., scoring the plot as a whole, and classifying all the leaves from individual plants into categories based on the amount of disease present on each leaf.

The leaf-classification method proved very laborious and required the services of four persons for approximately six hours. Ten plants were selected at random from each plot. The leaves were separated and classified in six categories (0 to 5) indicative of the amount of blighted surface and ranging from no blight to leaves dead. The percentage of blighted foliage for each plot was then calculated from the formula $P = \frac{\text{Sum of } (n \times v)}{5N} \times 100$ where P = per cent. of blighted foliage, n = number of leaves in each category, v = numerical value of each category, and N = total number of leaves in sample. Dividing by $5N$ and multiplying by 100 gives the percentage of disease in terms of the maximum possible for the sample.

The plot-scoring technique enables one person to score 40 plots in under an hour. Accuracy depends on the experience of the observer, who should endeavour to classify the plot as a whole as it appears on close examination. The scale used ranged from 1 (trace of blight on lowest leaves) to 9–10 (topmost leaves blighted; foliage becoming chlorotic; lesions on the petioles). These scores are converted to per cent. of diseased foliage by multiplying each by 10.

A table is given showing the data obtained from 40 plots by each method, together with the correlation analysis. That both methods give equivalent results is shown by the mean values of 34·36 and 36·75 per cent. blight for the plot-scoring and leaf-counts methods, respectively, and by the high correlation co-efficient ($r = +0{\cdot}887$). It is concluded that the rapid, visual method of scoring the plot as a whole appears to be as accurate as more detailed methods for determining the amount of disease present.

Del Cañizo (J.). **Pulverización de Patatares y Remolachares (datos prácticos).** [Spraying of Potato and Beet fields (practical data).]—*Bol. Pat. veg. Ent. agríc., Madr.*, xi, pp. 359–374, 5 figs., 1942. [Received August, 1944.]

In this series of papers on the field spraying of economic crops in Spain, the writer has already dealt with the control of vine downy mildew [*Plasmopara*

viticola: *R.A.M.*, xx, p. 287] and fruit tree diseases (*Bol. Pat. veg. Ent. agríc., Madr.*, x, pp. 217–224, 1941). In the present contribution the author similarly discusses spraying apparatus and its use in the control of potato early and late blights (*Alternaria solani* and *Phytophthora infestans*) and beet leaf spot (*Cercospora beticola*).

SARDIÑA (J. R.). **La obtención de plantas resistentes a enfermedades.** [The development of disease-resistant plants.]—*Bot. Pat. veg. Ent. agríc., Madr.*, xi, pp. 43–96, 2 figs., 7 diags., 1942. [Received August, 1944.]

This is a fully documented, critical survey of some outstanding recent contributions to various aspects of the problem of breeding for disease resistance in plants.

DEIGHTON (F. C.). **Diseases of cultivated plants in Sierra Leone.**—38 pp., Freetown, The Government Printer, 1943.

This useful annotated list of the diseases of cultivated plants in Sierra Leone [cf. *R.A.M.*, xvi, p. 208] is intended primarily for Agricultural Officers. The hosts are divided into four groups: (1) cereals, (2) plantation crops and fruit trees, (3) other crops, and (4) ornamentals, and are arranged alphabetically in each group, the ornamentals under their botanical names, the others in English. The notes provide information on the local distribution, symptoms, and control of the diseases.

JAMES (W. O.). **An introduction to plant physiology. Fourth Edition.**—viii+269 pp., 34 figs., 32 diags., 8 graphs, Oxford, Clarendon Press, 1943. 8*s.* 6*d.*

Developments in plant physiology during the past six years necessitated the revision and partial rewriting of this useful text-book.

GARRARD (E. H.). **Disinfection and sterilization.**—*Food in Canada*, iv, 8, pp. 9–13, 4 figs., 1944.

This is a review of recent developments in the disinfection and sterilization of foodstuffs for the elimination of moulds, yeasts, and bacteria, among the methods discussed being the chemical treatment of walls, floors, etc., in packing plants, dairies, store rooms, and the like; sterilization by hot water, steam under pressure, or chlorination of utensils, vats, and containers; ozonization of the air; mists and sprays, of which hypochlorites appear to be particularly effective; acid detergents; ultra-violet radiation; and the natural preservatives inherent in certain products.

ELLIKER (P. R.). **A new quantitative method for estimation of total combined length of mold fragments in butter.**—*J. Dairy Sci.*, xxvii, 5, pp. 369–375, 1944.

The procedure herein described for the determination of total combined length of dead mould (*Oospora lactis*) fragments per mg. butter [*R.A.M.*, xxiii, p. 238 and next abstract] consists in the dilution of 1 gm. butter in a hot (70° to 75° C.) gum solution, spreading a small quantity on a glass slide, staining with Newman's reagent, and examination under low-power magnification. The average length of hypha per field is multiplied by the microscope factor divided by 1,000 and the results reported in mm. per mg. butter.

ELLIKER (P. R.). **Retention of mold fragments by butter, buttermilk and wash water during manufacture of butter.**—*J. Dairy Sci.*, xxvii, 7, pp. 563–569, 1944.

The total visible mould (*Oospora lactis*) hyphae count was determined on butter, buttermilk, and wash water of laboratory and commercial churnings at the Purdue Agricultural Experiment Station, Indiana [see preceding abstract]. The resulting

data indicated that butter usually retained over 50 per cent. (49 to 92 in five commercial samples) of the total length of hypha, whereas the wash water yielded a very low proportion (0·4 to 10·4), the figures for buttermilk (into which most of the minute hyphal fragments seemed to pass) being intermediate (7·2 to 40·6). In three laboratory samples the mould percentages in butter, buttermilk, and wash water ranged from 64·1 to 79·5, 18·7 to 35·3, and 0·5 to 1·8, respectively.

WHALLEY (MURIEL E.). **Abstracts on penicillin and other antibiotic substances.**—71 pp., Ottawa, National Research Council of Canada, 1943. $1.00. [Mimeographed.]

These abstracts of papers on penicillin and other antibiotic substances are taken from *Amer. chem. Abst.* from 1917 to 10th September, 1943, inclusive, and other publications. They are arranged alphabetically according to authors, and an index of the antibiotic substances dealt with is provided.

OVERHOLTS (L. O.). **The fungistatic powers of Penicillium notatum.**—*Proc. Pa Acad. Sci.*, xviii, pp. 32–39, 1 fig., 1944.

Of the 29 decay- and disease-producing fungi grown in malt agar cultures in proximity to *Penicillium notatum*, only *Stereum frustulosum* exhibited an unusual degree of antagonism to the mould, the distance between the organisms after 17 days still ranging from 4 to 6 mm. A somewhat lesser degree of mutual aversion was observed between the mould and *Ceratostomella pilifera*, *Collybia velutipes*, *Endothia radicalis*, *Lenzites trabea*, *Morchella crassipes*, *Polyporus fissilis*, *S. hirsutum*, and *S. sericeum*.

PONTECORVO (G.) & GEMMELL (A. R.). **Genetic proof of heterokaryosis in Penicillium notatum.**—*Nature, Lond.*, cliv, 3912, pp. 514–515, 1 fig., 1944.

Independently of Gladys E. Baker's work on the nuclear behaviour of *Penicillium notatum* [*R.A.M.*, xxiii, pp. 451, 494], the authors had also concluded that the older cells of the mycelium, the sterigmata, and the conidia are generally uninucleate, that the cells at the growing edge of the colony are usually multinucleate, containing up to a dozen nuclei each, and that hyphal fusions occur between branches of the same and different hyphae.

The fact that the conidia of *P. notatum* are uninucleate makes a genetic analysis possible. The technique is as follows: (1) production by X-rays of mutant strains, (2) mixed inoculation two by two of different mutant strains, and (3) search for non-mutant (wild-type) patches or for patches differing from either strain at the centre of the mixed colony and along the radii where the mycelia of the two strains are in contact. Mixed inoculation two by two of five such X-ray induced mutants, all characterized by a reduced pigmentation of conidia or by a complete failure to form conidia, gave the following results. All combinations of any two of four strains and none of the combinations involving the fifth (non-conidial) strain produced patches of mycelium with green conidia or with conidia differing from either of the strains used. When these conidia were plated out, the two component strains were recovered, confirming the fact that hyphal fusions and migration of nuclei from one strain to the other had taken place. Segregation of parental nuclei occurred at some stage between conidiophore and conidia formation.

Though each conidium carried a single nucleus, all those of one penicillus were of uniform pigmentation controlled by the constitution of the hypha from which the penicillus arose. If the criteria of genetics are valid in this case, then four of the five X-ray mutations tested behaved as if recessive. In the non-conidial mutation, failure to produce green conidia in mixed inoculi was probably due to dominance of the non-conidial effect. If this is confirmed, the high frequency

with which non-conidial mutants have been found, even without irradiation, is because of the dominance of their character.

FERNANDEZ VALIELA (M. V.). **Introducción a la fitopatología.** [Introduction to phytopathology.]—623 pp., 14 pl. (2 col.), 136 figs., 8 diags., 1 graph, 1 map, Federación Universitaria de Buenos Aires, Centro Estudiantes de Agronomía, 1942. [Received November, 1944.]

This valuable acquisition to phytopathological literature comprises the most complete account of plant diseases and cognate subjects hitherto published in the Spanish language. In addition to copiously documented up-to-date information on the incidence, geographical distribution (with special reference to Argentina), symptomatology, etiology, modes of perpetuation, economic effects, and control of numerous fungal, bacterial, virus, and physiogenic diseases, the treatise contains sections dealing with such general matters as the antecedents of phytopathology and its relation to other branches of science, the pathological changes induced by disease, the influence of environmental conditions, the classification of parasites and diseases, resistance and immunity (natural and acquired), and the like; the taxonomy and morphology of the bacteria and fungi concerned in the causation of plant diseases; the preparation and application of fungicides; and plant-protective legislation. An appendix furnishes instruction on the collection and transmission of specimens, the preservation of herbarium material, and the various regional phytopathological services at the disposal of Argentine farmers; and a host index is provided with a list of the diseases affecting each. Two useful charts are enclosed, one dealing with the classification of the fungi, and the other (partly coloured) with the symptoms produced by the cereal rusts and their organs of reproduction.

DOWNIE (D. G.). **Notes on the germination of Corallorhiza innata.**—*Trans. bot. Soc. Edinb.*, xxxiii, 4, pp. 380–382, 1943.

Good though very slow growth of the orchid *Corallorhiza innata* was obtained in a medium of Pfeffer's nutrient salts plus potato extract inoculated with its symbiont, a member of the Basidiomycetes with septate hyphae and clamp-connexions described by Burgeff [*R.A.M.*, xvi, p. 115] as *Mycelium radicis* (*Corallorhiza*) *innatae*. The microscopic examination at the end of nine months of the cream-coloured, pear-shaped protocorms, measuring 0·2 to 1·6 mm., after treatment with lactophenol and cotton blue, revealed the entry of the fungus into the basal cells, where it had formed the characteristic 'pelotons' or coiled hyphal stages commonly found in endotrophic mycorrhiza.

DOWNIE (D. G.). **Source of the symbiont of Goodyera repens.**—*Trans. bot. Soc. Edinb.*, xxxiii, 4, pp. 383–390, 1943.

Rhizoctonia goodyerae-repentis, the symbiont of *Goodyera repens* [cf. *R.A.M.*, xxii, p. 171], was isolated indirectly from the soil of a Scots pine (*Pinus sylvestris*) wood near Aberdeen, where it grows in the surface litter, but apparently does not survive in the older compact humus. Evidence is submitted for the presence of the fungus on the bifoliar spurs of the trees before shedding, a fact with an important bearing on the distribution of the symbiont in the soil and the colonization of the latter by the orchid. These observations appear to contradict Knudson's hypothesis that orchid seed germination under natural conditions is effected by the action of non-symbiotic saprophytic fungi on the organic substratum [ibid., vii, p. 387].

MOLLISON (JANET E.). **Goodyera repens and its endophyte.**—*Trans. bot. Soc. Edinb.*, xxxiii, 4, pp. 391–403, 7 figs., 1943.

Goodyera repens seeds sown on Pfeffer's nutrient medium inoculated with *Rhizoctonia goodyerae-repentis* [see preceding abstract] contract infection by the fungus

in the course of five days. Growth of the embryo begins immediately on the penetration of the suspensor cells by the hyphae and before the digestion of the fungus by its host, evidence of which is apparent 28 days after sowing. Asymbiotically germinated protocorms of the orchid, on transference to culture of the symbiont, become infected in 56 hours, digestion ensuing from the 14th day onwards.

The roots and rhizomes of adult plants in nature were found to be invariably infected by the symbiont. Evidence of successive infections of the host is demonstrated by the occurrence of interrupted zones of invasion in the rhizome. Reinfection of that organ takes place through the absorbing hairs, and each new root is infected by mycelium in the humus. A decline of vitality in the fungus after some length of time in the host is suggested in explanation of its failure to infect the meristems of the root apex and of the lateral buds and cells where chlorophyll is developed.

MACDOUGAL (D. T.) & DUFRÉNOY (J.). **Mycorrhizal symbiosis in Aplectrum, Corallorhiza and Pinus.**—*Plant Physiol.*, xix, 3, pp. 440–465, 9 figs., 1944.

The results of a comparative study in California on the endophytic mycorrhiza of the orchids *Corallorhiza maculata* and *Aplectrum hyemale*, and on the ectendotrophic symbiont of the Monterey pine [*Pinus radiata*] are presented. In *A. hyemale* the stem-fungus association has induced a mutation involving the adjustment of the plants to the coralloid or mycorrhizal stem form anatomically similar to the nearly related *C. maculata*. The mycelium of the mycorrhiza of the last-named gains access to the cortex at an early stage; in its growth it keeps pace with the differentiating meristem, extruding branches through the epidermal cells of underground coralloid branches in simulation of the arrangement of root hairs. The non-parasitic character of the symbiont was established by various observations, including the absorption of inorganic phosphorus from the soil by the fungus and the stages of its metabolism terminating in the root stele, and the capacity of isolated segments of the mycorrhizal roots to survive and grow like a chlorophyll-less plant. The mycelium of the endophytic mycorrhiza, advancing towards the growing tip of the coralloid branches, forms dense swirls of hyphae enveloping the hypertrophied, densely granular nucleus. The hyphal masses disintegrate in the older portions of the stem and their contents become available to the still living cortical cells: further extension is barred by layers and islands of cells containing oxidized catechol. Both the fungus hyphae and the host cells are rich in mitochondria, the purpose of which has not yet been ascertained. Carbohydrate metabolism takes place mainly in the cortical cells. Auxins and vitamins are accumulated by, or originate in, the hyphae, whence they are translocated to the roots. Pads of material at the pores of the hyphal cross walls are thought to present analogies of composition and function with the sieve-plates of higher plants.

The pine-symbiont association does not appear to be connected with any heritable morphological alterations. The short lateral rootlets are invested directly by hyphal branches of the mycelia in the soil. The distribution of the hyphae in the cortex extends only as far as the endodermis in which catechol tannins are formed; the middle lamella of the outer cortex is traversed and its disintegration products are available for absorption. Palmated, branching hyphae enter the cortical cells and become closely intermingled with a minutely vacuolate cytoplasmic mass, suggestive of a mechanism of exchange. The phenolic compounds in the root pericycle and endodermis, on escape from the vacuoles, oxidize to tannin, which 'fixes' the protoplasm as seen in the brown peripheral layers of old mycorrhiza.

MACDOUGAL (D. T.) & DUFRÉNOY (J.). **Study of symbiosis of Monterey Pine with fungi.**—*Yearb. Amer. phil. Soc., 1943*, pp. 170–174, 1944.

The mycorrhizal partner of the Monterey pine [*Pinus radiata*] in California [see preceding abstract], when actively penetrating the root tissues, gives an intense blue coloration with the molybdenum reagent indicative of bound phosphorus dissolved in the vacuolar solution. Reaction with paraphenylenediamine, resulting in the formation of indophenol blue, affords evidence of high oxidase activity in the ectendotrophic mycorrhiza. The production of indophenol blue with 2–6 dichloroquinone chloro-imide indicates an abundance of pyridoxin in the mycorrhiza, located principally in the outer hyphae in contact with the soil, and in the 'mantle'. It is the remobilization of pyridin derivatives from the soil by the symbiotic fungus, and their translocation by the latter to the root cells, that enables isolated root segments of the host to survive and develop.

MCLEAN (J. G.) & KREUTZER (W. A.). **The determination of virus infections in the Potato tuber by the use of ultraviolet light.**—*Amer. Potato J.*, xxi, 5, pp. 131–136, 1944.

The possibility of reducing the amount of virus infection in potatoes by examining the seed tubers in ultra-violet light prior to planting and discarding those showing fluorescence was investigated in the following way. The authors examined the cut surfaces of more than 1,000 Bliss Triumph tubers under an H–4 type mercury vapour lamp at 40° F. and classified them on the basis of the intensity (none, low, moderate, or intense), location (in the vascular ring, diffuse throughout the tuber, or in the cortex), and colour (white or yellow) of their respective fluorescence. The tubers were then planted and the resulting plants examined at weekly intervals, from emergence to maturity, for virus symptoms. The results showed that as the intensity of fluorescence increased there was a decrease in healthy plants in the field from 30·7 per cent. to nil, and a corresponding increase in the amount of leaf roll. Yellow fluorescence in the vascular ring generally indicated spindle tuber, and white fluorescence leaf roll. When fluorescence was observed in the vascular ring the only mosaic which appeared was one in combination with spindle tuber. Diffuse fluorescence indicated, for the most part, mosaic or combinations of mosaic and spindle tuber, although a few plants infected with only spindle tuber also appeared in this group. Out of 14 tubers with cortical fluorescence, 13 produced plants infected with rugose mosaic.

It is suggested that the outlined method may be used with reasonable accuracy in foundation and tuber-unit seed plots, and even possibly in the laboratory for disease identification and to supplement tuber-indexing.

PAILTHORP (R. R.). **War approved seed Potatoes in 1944.**—*Amer. Potato J.*, xxi, 5, pp. 136–139, 1944.

The following minimum requirements for seed potatoes produced in 1944 serve as a basis for approval of State specifications by the War Approved Seed Potato Committee of the United States Department of Agriculture. At the time of any field inspection by the State Agency, the field shall not show more than 5 per cent. each of leaf roll, mosaic, and spindle tuber; 2 per cent. yellow dwarf; 3 per cent. other virus; 5 per cent. each of witches' broom, 'hay wire' [*R.A.M.*, xvi, p. 490], giant hill, rosette, spinach leaf, and curly dwarf, the total for all six not exceeding 7 per cent.; 1 per cent. varietal mixture; 5 per cent. purple top wilt [aster yellows virus]; late blight [*Phytophthora infestans*] not above a limit at which observation of other diseases becomes impossible; ¼ per cent. bacterial ring rot [*Corynebacterium sepedonicum*]; and no potato wart [*Synchytrium endobioticum*] or nematodes. All potatoes must be subjected to a final pack inspection, at which they shall show

no more than 2 per cent. each of spindle tuber (visible) and late blight (any degree); 1 per cent. each of soft rot or wet breakdown (any degree) and varietal mixture; 5 per cent. each of deep pitted scab [*Actinomyces scabies*] (damage, interpreted according to the U.S. Standards for Potatoes) and hair sprout (any degree) [ibid., xxiii, p. 454]; 6 per cent. stem-end discoloration (serious damage); 0·1 per cent. ring rot (any degree); and no potato wart or nematodes.

DYKSTRA (T. P.). **Potato production problems in China.**—*Amer. Potato J.*, xxi, 5, pp. 123–131, 1944.

The author, assigned by the American State Department to help Chinese specialists in establishing a national potato programme, gives this first report on his work at the National Agricultural Research Bureau at Pehpei, near Chungking, Szechwan, since 1942. An examination of plants grown from the 8,000 tuber indexes taken at random from practically every important potato-growing province in Free China (Szechwan, Yunnan, Kweichow, Honan, Hupeh, Shensi, and Kansu) showed that practically 100 per cent. of them had virus infection (mainly leaf roll but also rugose mosaic, mild mosaic, and spindle tuber), indicating the prevalence and seriousness of virus diseases in China. None of the lots could be used as a source of virus-free seed. The inspection of the potato-growing district of Penghsien, Szechwan, involving about 25,000 acres, showed that almost all plants were infected with leaf roll, and many with rugose mosaic, aphids, apparently *Myzus persicae*, being commonly found on potato foliage. The only exception in the district was one small field near the top of a mountain which was completely free from virus disease. It was learned that the owner of this field had been saving his own seed for over 10 years. The entire crop from this field was bought up to be used next year as seed potatoes. A survey of the Kweichow Province in south-western China, including the ideal potato country in the region of Weining, showed practically 100 per cent. of the plants to be infected with leaf roll and several plants were found with typical witches' broom. However, a few fields were almost completely free from virus diseases and arrangements were made to buy up healthy and nearly healthy seed potatoes of the three local varieties. In north-western China, where the acreage devoted to potato-growing is increasing every year, the potato being a major crop and providing the main diet for more than 50 per cent. of the population, it was found that not a single field was free from virus infection. Leaf roll was predominant, but occasionally severe rugose mosaic was observed and spindle sprout was found frequently. Late blight [*Phytophthora infestans*], first observed in early August, had become epidemic by late September, potatoes planted without ridging and in some cases with only 1 ft. between the rows providing ideal conditions for the development of the disease.

For the whole of the country, the aggregate annual reduction in yield caused by leaf roll alone is stated to amount to several million bushels. It is planned to purchase virus-free fields and to plant potatoes as tuber units next year in the same area and the following year in a larger area with a view to distributing disease-free seed potatoes to the growers of table stock as soon as sufficient quantities have been accumulated. It is believed that the yield per unit area could be doubled by growing disease-free seed of varieties commonly found in China. Of 52 American varieties now being tested Sebago, if adapted to the north-west, may become the major variety of the region because of its resistance to late blight.

STARR (G. H.). **Hot water for the control of Potato ring rot bacteria on the cutting knife.**—*Amer. Potato J.*, xxi, 6, pp. 161–163, 1944.

In tests conducted during 1942 and 1943, it was shown that knives used in cutting potato seed pieces and responsible for much spread of bacterial ring rot

(*Corynebacterium sepedonicum*) [*R.A.M.*, xxiii, p. 275] can be made sterile by the use of boiling water. The following test was made: the knife was drawn through ring rot-infected tubers and then immersed in hot water held at various temperatures (between 150° and 200° F. for periods of 5, 10, or 15 seconds); it was then removed and used to cut healthy tubers in halves, repeating the immersion before each cut. The seed pieces obtained were planted out and the plants inspected for ring-rot symptoms several times during the season, as well as stem smears on slides made for subsequent staining and microscopic examination. The results showed that a power-driven rotary knife may be sterilized by continuously running in a vat of boiling water ('200°') and ordinary knives by dipping them in boiling water for 10 seconds. Temperatures lower than boiling point were not effective, no control whatever resulting at 150°, and five seconds' immersion proved insufficient. No reduction in stand or vigour of the resulting plant was observed to follow the use of a hot knife.

GILMORE (L. E.) & ROBINSON (C. H.). **Studies in seed Potato treatments. III. Agencies and practices that reduce the strength of mercuric chloride solutions, causing ineffective disinfection. IV. The repeated use of corrosive sublimate solutions by strength-control and by acidulation with acetic acid for effective disinfection practice.**—*Sci. Agric.*, xxiv, 8, pp. 351–357, 358–365, 1944.

Continuing their studies on mercuric chloride solutions used for seed potato treatments [*R.A.M.*, xxii, p. 448] the authors found that for the standard long soak used in Canada (1½ hours in 1 : 1,000 solution) it appears to be conclusive that sacks, crates or hampers, soils, and vessels with metal parts that come into contact with the solution rapidly render it useless, possibly owing to both chemical reduction and physical adsorption; for instance, dirty used sacks effected a loss of 15 to 45 per cent., washed sacks 6 to 28 per cent., 1 lb. soil to 5 l. solution 11 to 30 per cent., washed potatoes 3 to 11 (average 5·6) per cent., and wooden vessels 0·5 to 3·8 per cent. Well-water of good drinking quality and the reducing substances in the tubers (if cut tubers are eliminated) are of negligible effect. The following recommendations are made: (1) use concrete, porcelain, or wooden vessels; (2) do not treat potatoes in sacks, or in crates or hampers held together with wire or nails; (3) remove soil and vegetable matter from the tubers, preferably by soaking, before treatment; and (4) test and adjust the strength of the solution according to the authors' method [loc. cit.] before treating each lot of tubers.

In the second paper it is shown that the strength of mercuric chloride in nine successive treatments of washed potatoes was reduced by less than 6 per cent. per treatment when the authors' method of testing and adjusting was used.

If the standard long soak is considered unsatisfactory, an acidulated treatment may be substituted. Twenty successive lots of unwashed potatoes were treated (10 minutes each) in a wooden vessel containing 2 gm. mercuric chloride and 16·7 ml. glacial acetic acid per l. without need of adjustment of any kind, a total of less than 10 per cent. mercuric chloride and 5 per cent. acetic acid being lost at the end of the experiment. Sacks, crates, hampers, soil, and refuse must also be kept out of the acidulated solution, but the tubers need not be washed. A considerable saving in labour and material costs is possible by the use of the acidulated treatment.

Progress of Potato late blight.—*Plant Dis. Reptr*, xxvii, 16, pp. 302–307; 17, pp. 382–387; 18, pp. 419–423, 1943. [Mimeographed.]

Tables are given showing the areas where mean temperatures were favourable (up to 78° F.) or unfavourable (above 78°) to the spread of potato late blight (*Phytophthora infestans*) in different parts of the United States at weekly intervals

during the period 17th August to 14th September, 1943, followed by reports from the different States on the prevalence of infection.

Trials of Potatoes for immunity from wart disease.—*J. Minist. Agric.*, li, 8, pp. 382–383, 1944.

A descriptive list is given of new potato varieties added to the list of approved varieties found in trials by the Ministry of Agriculture to be immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xx, p. 30], viz., Home Guard, Strathearn Early (early), Stormont Dawn, Ulster Cromlech, Dr. McIntosh, and Ulster Early (early maincrop).

RIEMAN (G. H.), TOTTINGHAM (W. E.), & MCFARLANE (J. S.). **Potato varieties in relation to blackening after cooking.**—*J. agric. Res.*, lxix, i, pp. 21–31, 1 pl., 1944.

Twenty-three potato varieties and strains grown for five years in nine widely separated localities in Wisconsin showed consistent differences in the amount of blackening that developed after boiling [*R.A.M.*, xxiii, p. 76]. Triumph and Chippewa showed only half as much blackening as Rural New Yorker and Russet Rural. Eight named varieties developed through clonal selection behaved similarly to their parent varieties.

The white-cooking tendencies presented by the closely related Chippewa, Katahdin, and Sebago varieties suggest that they carry genetic factors for white tuber flesh after boiling. The behaviour of F_1 progenies from Katahdin and Sebago crossed with dark-cooking Hindenburg supports this assumption. White tuber flesh after cooking was dominant or incompletely dominant to grey tuber flesh after cooking. Parent types were easily recovered among 267 F_1 individuals, indicating simple factorial interactions for after-cooking blackening. Segregation in the F_1 generation demonstrated heterozygosis in the parent stocks.

Evidently, the dark-cooking character is inherited. Climatic factors had a marked influence on the formation of substances in potato tubers that darken after boiling, but soil type and fertility had only a limited influence. Storage conditions had a strong effect on blackening.

DAINES (R. H.). **Borax dip of Sweet Potatoes safened by the use of calcium salts on the bedding soils.**—*Plant Dis. Reptr*, xxviii, 8, p. 312, 1944. [Mimeographed.]

Serious boron poisoning may be caused by the otherwise effective treatment for the control of sweet potato black rot [*Ceratostomella fimbriata*] consisting of a ten-minute soak before bedding in a borax solution (1 lb. in 5 gals. water). At the New Jersey Agricultural Experiment Station, for example, up to 30 per cent. of the sprouts arising from boron-treated roots have shown toxicity symptoms, of which the most prominent is a darkening of the veins near the leaf margins, sometimes extending to the midrib and rapidly destroying the tissues within the affected area. This form of injury was found to be largely preventable by the admixture with the bedding sand of small quantities of calcium salts, e.g., ½ lb. lime or 1 lb. gypsum per 100 sq. ft.

ALLEN (P. J.), NAGHSKI (J.), & HOOVER (S. R.). **Decomposition of Guayule resins by microorganisms.**—*J. Bact.*, xlvii, 6, pp. 559–568, 1944.

At the Eastern Regional Research Laboratory, Philadelphia, the authors studied the occurrence of resin-decomposing organisms during the retting of guayule (*Parthenium argentatum*) shrub by the natural microflora. A method is described for the detection of such organisms by their ability to cause clearing of resin emulsions suspended in agar. Among those identified were *Actinomyces fradii*, *Aspergillus*

fumigatus, Rhizopus arrhizus, and one of the Dematiaceae. All the organisms were found to attack some portion of the crude rubber extract, but the unsaponifiable fraction contains compounds utilized only by *Actinomyces fradii* and the Dematiaceous fungus, the latter also digesting the exuded resin. The rate and extent of clearing of resin-agar emulsions by the organisms was shown to be correlated with resin decomposition in liquid culture.

SALMON (E. S.). **Four seedlings of the Canterbury Golding.**—*J. Inst. Brew.*, N.S., xli, 5, pp. 244–250, 4 figs., 1944.

Descriptive notes are given on four seedlings raised from the Canterbury Golding hop by crossing it with pollen from a male plant of Brewer's Gold at Wye College, Kent, in 1934. One of them, designated Southern Brewer (WFA 111), is susceptible to mosaic, while the remaining three, viz.: Northern Brewer (WFB 135), John Ford Hop (WFA 90), and Wye Field Golding (WFC 81), are apparently immune from the disease though infected.

WILSON (J. D.) & RUNNELS (H. A.). **Fixed coppers to control Ginseng blight.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 228, pp. 135–144, 1944.

As a result of further experiments in the control of ginseng blight (*Alternaria panax*) in Ohio [*R.A.M.*, xvii, p. 447], where the disease occurs in a semi-epidemic form nearly every year, it is recommended that spraying should commence as soon as most of the plants have emerged in early May, and be continued at fortnightly intervals until about three weeks after bloom, six or seven applications being involved by this schedule in the average season. Bordeaux mixture (6–6– or 8–8–100) plus calcium arsenate (4 lb.) was the most effective of the copper-containing fungicides tested, and should be preferred to the fixed coppers under ordinary conditions; it is, however, liable to injure the stands in wood-lot plantings during spells of drought and should be replaced in such situations, e.g., by copper A [ibid., xxiii, p. 74] with the addition of calcium arsenate and flour or bentonite (4–4–4–100). The admixture of a good wetting agent, such as Grasselli spreader and sticker (1 in 1,600), is advisable in all cases.

ASTHANA (R. P.) & MAHMUD (K. A.). **Tip-burn of Piper betle in the Central Provinces.**—*Curr. Sci.*, xiii, 9, p. 234, 1 fig., 1944.

Piper betle in the Central Provinces sustains considerable damage from tipburn during the hot weather (about the end of March to the middle of May), varieties with a thin, soft foliar texture, such as Kapuri, being particularly susceptible. Wilting originates at the extreme tip of the leaf and sometimes extends right round the margin; later the affected tissues turn brown and undergo necrosis, eventually becoming hard and brittle, so that they are readily broken or torn. Diseased leaves do not fall, but remain attached to the vines in a flaccid condition, differing in this respect from those attacked by fungi or bacteria. Tipburn is caused by excessive loss of moisture from the foliage under the influence of heat, while a contributory factor to mortality from the disturbance is the poor root system associated with infection by *Phytophthora parasitica* var. *piperina* [*R.A.M.*, xxiii, p. 457]. Proper shading and irrigation of the gardens during the critical period should reduce the incidence of tipburn to a minimum.

INNISS (B. DE L.). **Sugar-Cane mosaic disease in Jamaica and Barbados.**—*Bull. Brit. W. Ind. centr. Sug. Cane Breed. Sta.* 26, pp. 12–21, 1944.

In some areas of Jamaica, sugar-cane mosaic [*R.A.M.*, xxii, pp. 78, 352] can be controlled by the systematic roguing of susceptible varieties, whereas in others, although roguing is practised, effective control has not yet been secured. To control the disease on an estate where no control methods have been practised or

where they have been found impracticable, the windward side should be planted to resistant or immune varieties, which should be worked right across the estate. When the fields first planted on the windward side are to be replanted, disease-free material of the desired susceptible varieties can be used.

A table is given, based on observations made on sugar estates and on mosaic disease trials at Hope, giving the seedlings sent to Jamaica from the British West Indies Cane Breeding Station, with their parentage, derivation, and reaction to mosaic. From this it appears that the vast majority of noble canes are highly susceptible, as are the Celebes and Chunnee 'nobilizations', while derivations of the Local form of *Saccharum spontaneum* when crossed with Chunnee 'nobilizations' appear to produce susceptible seedlings. In the Glagah line of 'nobilization', however, there is an almost 2 to 1 ratio in favour of resistance. Seedlings with Glagah 'blood' appear to be even more resistant. The seedlings of purely Glagah 'nobilization' produced by the Station have not been so successful commercially as those of Local and Chunnee 'nobilizations', though very few of the latter have shown resistance. The policy to follow in breeding seedlings for Jamaica is to combine the resistant Glagah 'blood' of *S. spontaneum* with the susceptible 'blood' of the Local form of the same species or that of *S. barberi* Chunnee, or both. This policy is being carried out.

Of the newer seedlings, B. 34104 seems the most promising locally. It possesses a wide range of adaptability, good juice, and exceptionally strong ratooning powers. Though very susceptible, it should be planted extensively on estates where the disease is under control or where clean material can be obtained for all new plantings. B. 3439 is highly resistant in Jamaica; the few stools that do contract the disease develop such severe symptoms that they can readily be detected; they should be at once removed. B. 37161 shows slight resistance in Jamaica, while infected stools appear to be tolerant. B. 37193 is resistant, but has not been tried on a large scale. B. 37172, B. 38155, and B. 38212 are resistant, but are still in testing or multiplication stages.

JOHANSON (ALFHILD E.). **An endo-operculate Chytridiaceous fungus: Karlingia rosea gen. nov.**—*Amer. J. Bot.*, xxxi, 7, pp. 397–404, 37 figs., 1944.

Karlingia rosea (*Chytridium roseum* De Bary & Woron.) comb. nov. occurs as a saprophyte in damp, rich soil in Germany, the Galapagos Islands, and various parts of the United States, and as a weak parasite on *Equisetum arvense* spores in France. It also makes luxuriant growth on air-dried onion skins, boiled, dechlorophyllized maize leaves, grass, and cellophane, imparting to these substrata a conspicuous rosy tinge. The cytology and morphology of the Chytrid are described at length.

BISBY (G. R.). **Nomenclature of fungi.**—*Mycologia*, xxxvi, 3, pp. 279–285, 1944.

As a basis for discussion, the writer comments on interpretations of the two articles, in the International Rules of Botanical Nomenclature, which deal particularly with fungi, and gives examples of actual or proposed usage.

STEVENSON (J. A.). **A preliminary list of authors of plant parasites with recommended abbreviations.**—*Plant Dis. Reptr*, xxviii, 11, pp. 366–395, 1944. [Mimeographed.]

In connexion with F. Weiss's revision of the 'Check List of Diseases of Economic Plants in the United States', which appeared in instalments in *Plant Dis. Reptr* between 15th April, 1940 (xxiv, 7), and 15th January, 1943 (xxvii, 1), the writer has compiled a very useful list of recommended citations for the names of the authors of plant parasites recorded therein, with contractions, where indicated,

based on Recommendation XXX of the International Rules of Botanical Nomenclature. In addition to the full names of the authors, totalling between 1,400 and 1,500 (mostly mycologists), the years of birth and death (where applicable) are furnished wherever available.

De Rezende Pinto (M. C.). **Hymeniales de Portugal.** [Hymeniales of Portugal.]—*Brotéria*, xi, 1, pp. 1–16; 2, pp. 62–80; 3, pp. 106–136, 1942; xii, 1, pp. 1–20; 2, pp. 58–75; 3, pp. 116–127; 4, pp. 180–190, 1943; xiii, 1, pp. 25–36; 2–3, pp. 131–140, 1944.

This is a critically annotated list (not yet complete) of some 865 Hymenomycetes collected in Portugal up to the end of 1940. The author's foreword is supplemented by tables (based on Saccardo's 'Flora italica cryptogama') showing the total number of genera and species in this group to be 106 and 1,110, respectively, in Portugal, as compared with 123 and 2,331, respectively, in Italy.

Mundkur (B. B.). **Fungi of the Northwestern Himalayas: Ustilaginales.**—*Mycologia*, xxxvi, 3, pp. 286–293, 1 fig., 1944.

This list of 21 smuts, including two species new to science and five new to India, is based on collections made in the north-western Himalayas by R. C. and I. D. Stewart.

Coe (D. M.). **Variations in single ascospore isolates of Sclerotinia sclerotiorum.**—*Mycologia*, xxxvi, 3, pp. 234–241, 3 figs., 1944.

In preliminary studies carried out at the Washington State College between 1940 and 1942, the author observed considerable variation in appearance of the 31 single ascospore cultures from an isolate of *Sclerotinia sclerotiorum* [*R.A.M.*, xxii, p. 240] from cucumber. The cultures could be readily divided into two groups: 14 of them resembled in every respect the parent isolate and are designated as the N or normal type, and 17 as the A or aberrant type. The latter exhibited a much slower radial growth, averaging 60 mm. in diameter after five days on potato dextrose agar at 19° to 20° C., whereas the N type cultures, grown under identical conditions, had all by then reached the edge of the Petri dish (90 mm.); after ten days sclerotia had just begun to form in the A type cultures, whereas they were nearing maturity in the N type. The mycelium of the A type was distinctly more cottony than that of the N type and formed such dense mats as to exclude light, the cultures assuming a definite brown colour at the agar surface. The sclerotia produced in these, and in the giant oat cultures, were fewer and more irregular in shape in the A than in the N type, and also showed a tendency to be flattened and depressed on the upper side in contrast to the domed shape of the N-type sclerotia. The bulk of sclerotia from the N-type cultures was approximately four times greater than from the A-type of the same age. When planted in separate sand cultures in the greenhouse, both types of sclerotia began their apothecial production at about the same time, but whereas the total numbers of apothecia produced by the N-type sclerotia ranged from 854 to 1,421, those produced by the A type ranged from 35 to 229. The N-type apothecia were indistinguishable from those produced by the original parent isolate. Macroscopically, the apothecia of the two types were more different than those of *S. sclerotiorum* and *S. trifoliorum*; those of the A type were dark, soft, and watery, while those of the N type were lighter in colour and firm and wax-like in texture. Under the microscope, the crushed hymenial tissue of the A-type apothecia exhibited a high ratio of paraphyses to asci in comparison with the N type, the asci and ascospores of the former being more irregular in outline, although similar in size. The average measurements of ascospores and asci were: for the N type 12·61 by 6·63 μ and 135·99 by 8·06 μ, respectively, and for the A type 12·30 by 6·89 μ and 134·76 by

7·91 μ, respectively. The second-generation single ascospore isolates from both types grown under the same experimental conditions corresponded exactly to the parent cultures.

The discovery of distinct morphological types in *S. sclerotiorum* is taken to indicate that, although this fungus is homothallic for sex, it may be subject to segregation for other characters. It is pointed out that the A type has never yet been isolated directly from diseased plant material, which may indicate either that this type is incapable of parasitism, that a sexual union by anastomosis occurs, or that the microconidia of *S. sclerotiorum* do have a sexual function.

DAVIDSON (R. W.). **Two American hardwood species of Endoconidiophora described as new.**—*Mycologia*, xxxvi, 3, pp. 300–306, 2 figs., 1944.

Comparisons of cultures of *Endoconidiophora coerulescens* from Europe, obtained from the Centraalbureau voor Schimmelcultures, with American isolates of this fungus [*R.A.M.*, xix, p. 315], revealed consistent and significant differences. The American fungus, commonly found on green sapwood of hardwood logs and lumber in southern United States, from Virginia to Florida and Louisiana, is therefore described as a new species, *E. virescens*. It differs from the European fungus in that it is chiefly confined to hardwoods, gives off a distinctive musty odour, and some of its conidiophores have a smaller diameter at the tip. Another related species, found causing a grey mould on chestnut oak (*Quercus montana*) tanbark in West Virginia, is described as *E. variospora* n.sp.

JENKINS (W. A.). **An appraisal of downy mildew as a factor in field losses of bright Tobacco in Virginia during the 1943 season.**—*Plant Dis. Reptr*, xxvii, 16, pp. 298–299, 1943. [Mimeographed.]

Attention is drawn to the correlation existing between the losses sustained in late crops of bright tobacco in Virginia in 1943 and the epidemic of downy mildew [*Peronospora tabacina*] which was responsible for the planting of these late crops. The losses in question ranged from 20 to 50 per cent., mainly in quality, representing a reduction in profit of $50 to $150 per acre, exclusive of losses from black shank [*Phytophthora parasitica* var. *nicotianae*] and Granville wilt [*Xanthomonas solanacearum*]. Many growers were forced, owing to the epidemic, to replant their crops several times, and, almost without exception, the percentage of mosaic transplants increased with each additional replanting.

WILSON (J. D.). **Tomato fruit drop, caused by early blight.**—*Plant Dis. Reptr*, xxvii, 20, p. 555, 1943. [Mimeographed.]

Early blight of tomato (*Alternaria solani*) was unusually severe in Ohio in 1943, causing an exceptionally high incidence of pedicel infection, which resulted in a shedding of up to 30 per cent. of the affected fruits, often at only a quarter or a third of their normal size. In one plot at the Agricultural Experiment Station, only 7 per cent. of the fruits from plants sprayed with a fixed copper plus calcium arsenate were abscissed at picking time, compared with 35 per cent. in the untreated controls [cf. *R.A.M.*, xxiii, p. 82].

Éire. Report of the Minister for Lands on Forestry for the period from 1st April, 1938, to 31st March, 1943.—65 pp., (?) 1944.

The following items of phytopathological interest occur in this report (pp. 33–34). Spraying of larches against *Meria laricis* [*R.A.M.*, xv, p. 761] was continued, but no serious attacks were reported. Oaks and other broad-leaved trees in a few nurseries suffered from mildew [?*Microsphaera quercina*], and *Rosellinia* was also present in one locality. *Adelopus* [*Phaeocryptopus gaeumanni*] occurred in two forests on Douglas fir [*Pseudotsuga taxifolia*], and rather severe infection by

Nectria on ash in another place. The honey fungus [*Armillaria mellea*], however, is the most troublesome fungal pest, especially on Sitka spruce [*Picea sitchensis*] on recently cleared areas, having been recorded in 14 forests during the period under review.

WRIGHT (E.). **Damping-off in broadleaf nurseries of the Great Plains region.**—*J. agric. Res.*, lxix, 2, pp. 77–94, 4 figs., 1 map, 1944.

The results of recent field and laboratory studies conducted in the 17 Federal hardwood nurseries of the Great Plains region of the United States showed that broad-leaved seedlings suffer from pre- and post-emergence damping-off, the former causing the destruction of the seed or the new radicle and thus preventing emergence, and the latter affecting seedlings from a few days to three weeks old and which may cause considerable losses. The affected seedlings may fall over on the ground or, more commonly, remain upright and later dry up and break off. Losses from this type of damping-off are seldom large within 24 hours but over a period of ten days may amount to from 20 to 35 per cent. of the stand. Sore shin, characterized by a reddish-brown lesion on the stem near the ground, is regarded as a phase of post-emergence infection; it is quite common and stunts seedlings two to four weeks old but is seldom fatal. Root rots and top infection of young seedlings are stated to be unimportant in this region. Only about half the hardwood species studied proved susceptible to damping-off, the most important being *Ulmus americana* and *U. pumila*, *Robinia pseud-acacia*, and *Chilopsis linearis*; these may suffer damping-off losses ranging from 10 to 60 per cent. The most important resistant species, for which control measures were unnecessary, were *Fraxinus pennsylvanica* var. *lanceolata*, *Catalpa speciosa*, *Celtis occidentalis* and *C. reticulata*, *Gleditsia triacanthos*, *Quercus macrocarpa*, and *Prunus virginiana*.

Isolations from diseased seedlings yielded chiefly *Rhizoctonia* [*Corticium*] *solani* (in the imperfect state and showing strain differences) and *Pythium ultimum*, but occasionally *Fusarium* spp. [unidentified] also. *Robinia pseud-acacia* appeared to be more frequently attacked by *P. ultimum* and *Chilopsis linearis* by *C. solani*. Soil inoculation tests showed that *P. ultimum* and several strains of *C. solani* are pathogenic to a number of broad-leaved species as well as to wheat, maize, and lucerne. Generally, pre-emergence losses among hardwoods from *P. ultimum* were greater in sterilized than in unsterilized soil, whereas *C. solani* was more effective in unsterilized soil. On the other hand, for post-emergence damping-off the percentage loss was greater when *P. ultimum* was inoculated into unsterilized soil and *C. solani* into sterilized soil. Preliminary tests with *F.* spp. indicated that these fungi may cause fairly heavy post-emergence damping-off in unsterilized, inoculated soil but very little pre-emergence infection except in sterilized, inoculated soil. With regard to control it is pointed out that, because of the uniformity of climatic and soil conditions prevailing throughout the region, all measures recommended would be applicable to the entire area. Since some soils showed heavier damping-off potentialities than others, only resistant species should be grown on such unfavourable sites, and susceptible species should not be grown in areas occupied during the preceding season by other susceptible hosts.

HONEY (E. E.). **Tree diseases observed in Wisconsin.**—*Plant Dis. Reptr*, xxviii, 6, pp. 172–180, 1944. [Mimeographed.]

This is an annotated list of diseases of conifers and hardwoods observed in Wisconsin during 1943, special mention being made of decay organisms.

POMERLEAU (R.). **Observations sur quelques maladies non parasitaires des arbres dans le Québec.** [Observations on some non-parasitic diseases of trees in Quebec.]—*Canad. J. Res.*, Sect. C, xxii, 4, pp. 171–189, 4 pl., 1944.

The author gives short notes on non-parasitic diseases of trees in Quebec, such

as galls of birch (*Betula papyrifera*), witches' broom of *Acer negundo*, various malformations of *B. lutea*, *B. papyrifera*, and *Picea glauca*, heartwood discoloration of *A. saccharum*, and fasciation of *Prunus pennsylvanica*, all of which are of unknown origin. Winter frosts are stated to be harmful to many broad-leaved as well as coniferous species, but still greater damage, particularly to *A. saccharum*, is caused by fluctuating temperatures and exposure to sunlight in the spring. Other causes of disease are excessive heat and drought, floods, malnutrition, harmful factory fumes, and dust.

WALTER (J. M.). **Wound dressing for London Plane trees.**—*Plant Dis. Reptr*, xxviii, 10, p. 356, 1944. [Mimeographed.]

The fungus responsible for canker stain of London plane [*Platanus acerifolia*] trees, a species of *Endoconidiophora* very closely related to *E.* [*Ceratostomella*] *fimbriata*, may survive for several days in the commonly used brands of asphalt tree wound paints contaminated by infected sawdust, fragments of bark and wood, or spores of the organism [*R.A.M.*, xx, p. 611]. In experiments in New Jersey, this prevalent mode of spread of the pathogen was obviated by the thorough admixture with wound dressings, of the gilsonite varnish type only, of 0·2 per cent. phenyl mercury nitrate. No infections resulted from inoculations with contaminated paint treated in this way, whereas the same material without the disinfectant chemical caused 90 to 100 per cent. infection.

PONTIS VIDELA (R. E.). **El 'mal de la tinta' del Nogal en la República Argentina.** [The 'ink disease' of the Walnut in the Argentine Republic.]—*Rev. B.A.P.*, xxvii, 313, pp. 31, 33, 2 figs., 1943.

Attention is drawn to the prevalence on walnuts in Argentina of the ink disease, attributed by the author to *Phytophthora citrophthora*, the agent of citrus gummosis or foot rot [*R.A.M.*, xxi, p. 195]. The disease, which occurs in the provinces of Mendoza, San Juan, La Rioja, Catamarca, and Córdoba, is characterized by a blackening of the cortex, starting at or near soil-level and extending upwards to the secondary branches; at the same time the fungus proceeds to girdle the entire tree and also migrates inwards, even the central cylinder being sometimes involved. From the cankers formed on the surface of the affected cortex a gummy substance is exuded, which turns black on exposure to the air. The foliage of diseased trees becomes chlorotic and is largely shed before death ensues, two to three years after the onset of the attack.

Control may be effected by the excision of the decayed tissues and the application of mercuric chloride (1 in 1,000), mercuric cyanide (1 in 100), or formalin (1 in 9) to the cut surfaces, which should then be painted with Bordeaux paste (1–2–10) or a mixture of linseed oil and commercial Bordeaux, the latter being particularly recommended for its adhesiveness and resistance to weathering.

WIMBUSH (S. H.). **Canker on Monterey Cypress in Kenya.**—*Emp. For. J.*, xxiii, 1, p. 74, 1944.

Nine-year-old Monterey cypress (*Cupressus macrocarpa*) trees growing 40 miles east of Nairobi on the Iveti Hills were found to be dying from the tops downwards and to show a resinous exudation from cankers on the upper branches. The disease closely resembled the description of that produced on the same host in California by *Coryneum cardinale* [*R.A.M.*, xviii, p. 492; xix, p. 623], and R. M. Nattrass reported that the cankers were associated with a fungus similar to the Californian organism. Evidence obtained indicated that canker incidence was closely connected with soil depth, the disease having attacked only those trees whose roots had failed to develop properly owing to the shallowness of the soil overlying the parent rock formation. Other *Cupressus macrocarpa* trees, 12 to 14 years old and

growing very vigorously on the southern slopes of Mount Kenya, were also affected. In this case, the outbreak had followed damage by monkeys, who had barked the main stem.

It is considered that, while in both plantations the disease attacked trees already weakened by other causes, a serious view must be taken of the appearance of the canker in Kenya. All unthrifty and diseased trees have been cut out, and a strict watch is being kept on the affected plantations. Seed of species of *Cupressus* that appeared to show immunity in California has been planted, and at two years of age *C. sargentii*, *C. forbesii*, and *C. sargentii* [var.] *duttoni* are showing the best form and growth rate.

MARTIN (J. F.). **Ribes eradication effectively controls White Pine blister rust.**—*J. For.*, xlii, 4, pp. 255–260, 1 graph, 1944.

The blister rust fungus [*Cronartium ribicola*] is disseminated by wind-borne spores from pine to *Ribes* for distances up to or exceeding 300 miles, whereas from *Ribes* to pines the radius of infection does not ordinarily extend beyond 900 ft., though under favourable conditions the parasite may reach the trees from highly susceptible species, e.g., black currant and *R. bracteosum*, situated a mile or more away. In white pine forest areas the disease may be combated by reducing the currants to an average of 25 ft. or less of live stem per acre. Thus, in protected areas in New Hampshire, New York, and Pennsylvania in 1934 the number of pines infected out of a total of 8,635 before and after eradication were 2,824 and 33 (32·7 and 0·4 per cent.), respectively, and the total number of cankers amounted to 6,603, of which 6,515 (98·7 per cent.) originated before extirpation of the alternate host, and 88 (1·3 per cent.) after. In 1937, out of a total of 25,725 pines, 6,062 were infected before and 183 after eradication (23·6 and 0·7 per cent., respectively), and the numbers of cankers originating before and after removal of the currants were 7,784 and 293 (96·4 and 3·6 per cent., respectively). In unprotected areas in the same two years, the numbers of pines infected out of 11,927 and 21,582 were 6,311 and 6,687 (52·9 and 31 per cent., respectively), bearing 16,626 and 10,684 cankers, respectively. Similar results have been obtained in other parts of the country. In Wisconsin and Minnesota, for instance, in 1941, the diseased trees out of a total of 6,440 on 23 protected plots numbered 964, of which only 35 contracted infection after *Ribes* eradication, mostly carried out in 1936, a few areas, however, having been worked in other years between 1932 and 1938. Of the 1,531 cankers located on the trees, only 54 (3·5 per cent.) originated after the extirpation of the currants. A study in Idaho in 1934 of five areas protected from 1929 to 1931 showed that only 0·6 per cent. of the pines developed cankers after *Ribes* eradication, compared with 28 per cent. on four comparable areas left unprotected during the same period.

Protection of white pine is more complete when the alternate host is eradicated prior to invasion of the area by *C. ribicola*. Thus, in the Upper Priest River drainage of the Kaniksu National Forest, the initial protection of 1924–5 kept the trees free from blister rust until re-working was carried out in 1941–2. In the Fox Creek and Big Creek drainages of northern Idaho, which were logged from 1926 to 1928, vigorous pine stands arose from seedlings, while several hundred *Ribes* per acre appeared at the same time. In 1932 or 1933, blister rust spread to the two areas, in which eradication was undertaken in 1937. In 1941, a survey revealed 3·6 per cent. infection in Fox Creek and 49·5 per cent. in Big Creek, where the work was carried out too late in the season to confer adequate protection. Both areas have since been re-worked, and in Big Creek the additional precaution of pruning the infected limbs from the trees has been taken.

During the four-year period from 1933 to 1936, initial *Ribes* eradication was performed on 1,405,867 acres in the western white pine [*Pinus monticola*] region,

but since that time the scope of the control programme has not admitted of the planned schedule of re-workings. Steady progress, however, has been made, and some 1,000,000 acres are now under protection.

An important result of *Ribes* eradication, often overlooked, is the natural re-stocking of protected areas thereby permitted with seedlings that would otherwise have been killed by the rust. In pine stands of aesthetic or recreational importance, as well as in forest nurseries, specially thorough protection is required which must be ensured by periodical re-workings.

BUCHANAN (T. S.). **Effects of pruning young Western White Pine.**—*J. For.*, xlii, 5, pp. 365–366, 1944.

The results of a study in Idaho on the effects of pruning, carried out in such a way as to stimulate the probable action of blister rust (*Cronartium ribicola*) twig and branch cankers, on 14-year-old western white pine [*Pinus monticola*] indicated that multiple infections of this type are not directly concerned in the death of the trees. The operation caused a loss of increment proportional to its severity, the measurements being somewhat significant ($P = 0{\cdot}09$) in the case of trees deprived of 25 per cent. of their foliage, and highly so ($P < 0{\cdot}01$) where 50 or 75 per cent. was removed. From the silvicultural standpoint, this decrease of growth is of interest to blister rust control agencies in the west, where pruning to save diseased trees and reduce the spore supply is being practised in some young plantings and natural stands.

LITTLEFIELD (E. W.). **A plantation of Ponderosa Pine in northern New York.**—*J. For.*, xlii, 5, pp. 364–365, 1944.

Attention is drawn to a ¾-acre plantation of *Pinus ponderosa* trees in Clinton County, New York, which have successfully withstood exposure to *Cronartium comptoniae* [*R.A.M.*, xx, p. 614] during the 33 years since they were set out as transplants in 1911. The alternate host, sweetfern [*Comptonia peregrina*], abounds in adjacent fields. All the infections observed on the trees were within 8 ft. of the ground. A sample count on 58 showed one living infected tree and two killed by the rust. Evidently *Cronartium comptoniae* is a relatively weak parasite on trees that have passed the juvenile stage, unless local conditions are unfavourable for its development on older material.

ANDERSSON (Y.). **Impregnering av träsilor med arsenik- och kopparhaltiga impregneringsmedel.** [Wooden silo preservation with arsenic- and copper-containing preservatives.]—*Landtmannen, Uppsala*, xxviii, 31, pp. 705–707, 1944.

The results of analyses made in connexion with experiments in the preservation of wooden silos in Sweden with arsenic (pressure and open-tank methods) [*R.A.M.*, xxi, p. 509] and copper (cuprinol) [ibid., xxii, p. 464] indicated that the latter can safely be used without the least risk of poisoning livestock by consumption of the stored fodder. In the case of arsenic, however, the danger of adverse effects on health, especially of poultry, is not altogether negligible, and it is recommended that the inner walls of silos thus treated should be painted with a tar or asphalt solution to prevent the leaching-out of the chemical from the wood.

EDWARDS (C. A.) & WALKER (J.). **Preservatives for farm fence posts.**—*Sci. Agric.*, xxiv, 8, pp. 366–372, 3 figs., 1944.

Studies at the Dominion Forest Nursery Station, Indian Head, Saskatchewan, on the preservative treatment of fence posts (7 ft. long and 3 to 5½ in. in diameter, peeled and seasoned) [cf. *R.A.M.*, xxiii, p. 51] showed that with creosote the greatest durability resulted from setting the posts to a depth of 30 in. in creosote heated to a temperature of 200° to 230° F. for one hour, and allowing them to

cool off in the creosote for 10 hours. Slightly less good results followed treatment in a 5 per cent. solution of zinc chloride heated to 190° to 200° for one-half to one hour, followed by cooling in the solution for 36 hours. Creozol (Coderre's Special) was much less effective than creosote. Copper sulphate (18 to 36 in. immersion for 12 hours) in a saturated solution (containing $2\frac{1}{2}$ to 3 lb. bluestone per gal. cold water) appeared greatly to increase the durability of green cut poplar posts.

The average durability of untreated tamarack [*Larix laricina*] and cedar posts was slightly less than that of posts of different species subjected to the most effective chemical treatments.

GROVES (J. W.) & SKOLKO (A. J.). **Notes on seed-borne fungi I. Stemphylium.**—*Canad. J. Res.*, Sect. C, xxii, 4, pp. 190–199, 5 pl., 1944.

In examining agricultural seed received at Ottawa, mainly from the Plant Products Division and the Canadian Seed Growers' Association, the authors isolated (from samples of 100 seeds, surface-sterilized, placed in Petri dishes on 2 per cent. malt extract agar, and stored at room temperature for ten days) the following fungi: *Stemphylium botryosum* (the imperfect stage of *Pleospora herbarum*) from seed of onion, leek, celery, asparagus, beet, Swiss chard (*Beta vulgaris* var. *cicla*), cabbage, turnip, pumpkin, carrot, red fescue (*Festuca rubra*), lettuce, flax, lucerne, parsnip, parsley, scarlet runner bean, timothy, pea, radish, rye, millet (*Setaria italica*), spinach, red clover, wheat, and broad bean (*Vicia faba*); *Stemphylium sarciniforme* only from clover seed; and *Macrosporium consortiale* Thüm., renamed *S. consortiale* (Thüm.) n. comb., from onion, celery, beet, Swiss chard, broccoli, cauliflower, cabbage, squash, pumpkin, carrot, lettuce, tomato, lucerne, parsnip, parsley, scarlet runner bean, bean, pea (most frequently on seed from Alberta and British Columbia, but not confined to the western provinces), radish, spinach, *Taraxacum kok-saghyz* imported from the U.S.S.R., and broad bean. Probable synonyms of *S. consortiale* are *S. verruculosum* (Zimmerm.) Sacc. and *S. congestum* Newton [*R.A.M.*, vii, pp. 363, 789].

SNYDER (W. C.) & BAKER (K. F.). **Diseases of seed Cabbage in California.**—*Plant Dis. Reptr*, xxvii, 18, pp. 394–398, 1943. [Mimeographed.]

A survey of the seed-cabbage fields of California in 1942–3, in the course of which over 90 per cent. of the cabbage seed acreage of the State was inspected, showed that the most important diseases of the crop were absent. Downy mildew (*Peronospora parasitica*) was of no importance. Leaf spots due to *Alternaria brassicae* and *A. circinans* [*A. oleracea*] were insignificant. Ring spot (*Mycosphaerella brassicicola*) was rare except in occasional very small patches of the locally-grown Colma cabbage which growers had allowed to go to seed for their own use or to sell to neighbours. Circumstantial evidence strongly suggested that ring spot is seed-borne. A leaf spot due to a species of *Cercospora* was observed, apparently for the first time on cabbage grown in California. Very slight infection by powdery mildew (*Erysiphe polygoni*) was noted on the lowest leaves of scattered plants. An occasional head showing drop (*Sclerotinia sclerotiorum*) was found in three or four fields, and infection of the seed stalks, producing white blight, occurred in three fields. A few plants with black ring virus [ring spot: *R.A.M.*, xvii, p. 151] were found in one field and aster yellows was occasionally present.

Of the diseases searched for but not found, black rot and black leg [*Xanthomonas campestris* and *Phoma lingam*, respectively], were the most important. The latter has not yet been reported from California. Records on market cabbages in recent years are summarized.

It is concluded that cabbage-growers should look well to their seed source and practise consistently both plant-bed and crop rotation.

AYERS (G. W.). **Studies on the life history of the club root organism, Plasmodiophora brassicae.**—*Canad. J. Res.*, Sect. C, xxii, 4, pp. 143–149, 27 figs., 1944.

This is a progress report on a study of *Plasmodiophora brassicae* [*R.A.M.*, xxiii, p. 283] carried out at Ottawa and Charlottetown, Canada, from 1940 to 1942. Resting spores of the fungus, obtained from thoroughly clubbed plant tissue which had been broken down by secondary invaders, were found to germinate well in tap water at room temperature in one to ten days, depending on the maturity of the spores. Frost appeared to hasten germination, but was not essential to it. The zoospores from resting spores are biflagellate and heterokont (with one short and one long flagellum) and vary greatly in size, being 2·8 to 5·9 μ in diameter. This variation in size is taken to indicate that growth of the zoospores takes place after their emergence from the resting spores, which are 2·8 to 3·8 μ in diameter. At no time was fusion of the zoospores observed. When a released zoospore comes in contact with root hairs or epidermal root cells of cruciferous seedlings, it settles down as an amoeba and penetrates the cell wall of the host to form a young thallus inside the cell. When multiple infection occurs in a single root hair, the separate thalli show no tendency to fuse. The thallus may or may not become greatly enlarged before cleavage of the protoplasm takes place to form irregular zoosporangial clusters. Each zoosporangium contains four to eight zoospores, which, at maturity, are discharged through small openings at the point of contact of the zoosporangium with the cell wall of the root hair, provided free moisture is present. Under adverse conditions, the protoplasm of the thallus has been observed to disintegrate. Depending upon conditions of moisture and temperature, from two to eight days (four to six at ordinary field temperatures of 62° to 70° F.) are required from infection of the host to the discharge of zoospores from the zoosporangium. Those zoospores constitute the second motile phase in the life-history of the fungus; they are biflagellate and heterokont, and except for their uniformly smaller size, 1·9 to 2·3 μ in diameter, indistinguishable from those arising from the resting spores. Whether or not the zoospores from zoosporangia increase in size after discharge has not been determined, nor is anything known of their subsequent role.

In controlled laboratory experiments, the minimum temperature limit for infection of the root hairs of swede seedlings by *P. brassicae* was found to be between 54° and 57°, the optimum at about 70°, and the maximum above 92°. The incubation period was progressively shortened with increase of temperature from 8 days at 56° to 58° to 2 or 2½ days at 90° to 92°, although conditions became less favourable for infection at the higher temperatures.

ESAU (KATHERINE). **Anatomical and cytological studies on Beet mosaic.**—*J. agric. Res.*, lxix, 3, pp. 95–117, 7 pl., 6 figs., 1944.

In this study of sugar beet mosaic [*R.A.M.*, xv, p. 549] conducted in California, examination of outdoor and greenhouse plants with systemic symptoms of the disease showed no degeneration and no foreign or abnormal bodies in the phloem, indicating that the mosaic virus is less intimately related to the phloem than is the curly-top virus.

In the mottled leaves of diseased plants, the yellow areas tended to be thinner than the green areas and showed certain juvenile characteristics, such as nearly isodiametric and rather closely packed cells with no typical differentiation into palisade and spongy layers. In the early stages of development, the yellow areas showed scanty cell division while the green areas continued to divide actively or even at abnormally high rates, and accordingly resemble healthy mesophyll or appear hyperplastic at maturity. In the early stages, therefore, the yellow areas with their larger cells appeared more mature than the green ones with their

numerous but smaller cells; later, however, when the green areas had matured, the yellow ones appeared as under-developed portions of the leaf. The degree of difference between the yellow and the green areas and between the diseased and healthy leaves was found to vary considerably.

The chloroplasts of the yellow areas were observed to undergo pathological changes of different degrees: in young cells they were deficient in number, possibly owing to delayed development or destruction of plastic primordia; in older cells they were pale and fragile and readily swelled and disintegrated when brought in contact with tap water. In some cases the chloroplasts were diffuse and irregular in shape, and stained lightly. In the most severely diseased cells, from which nuclei may be absent, the chloroplasts tended to fuse into amorphous masses. It is concluded that these degenerative phenomena, which are similar to others induced by many different injurious agents, are symptoms of physiological disturbances caused within the diseased cell by the presence of the virus but are not necessarily responses to any specific action of the virus.

BJÖRLING (K.). **Några svampsjukdomar på Raps och Vitsenap.** [Some fungous diseases of Colza and White Mustard.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, viii, 5, pp. 73–77, 11 figs., 1944.

Of recent years the acreage of oil-producing crops, notably colza and white mustard, has been widely extended in the south of Sweden, and in this connexion notes are given on the diseases caused by *Peronospora brassicae*, *Alternaria brassicae*, *Cercosporella brassicae*, and *Plasmodiophora brassicae*, of which the two first-named are the most prevalent.

LEACH (L. D.) & HOLLAND (A. H.). **Seed treatment of large Lima Beans in California.**—*Plant Dis. Reptr*, xxvii, 20, pp. 498–500, 1943. [Mimeographed.]

The average numbers of large Lima bean [*Phaseolus lunatus*] plants of four varieties emerging from 100 ft. of row in 11 fields in Ventura County, California, in 1943 from (*a*) untreated and (*b*) seed treated with spergon (0·25 per cent.) against *Pythium ultimum* and *Rhizoctonia* [*Corticium*] *solani*, sown at an average rate of 87 lb. per acre were, respectively, 109 and 146 [*R.A.M.*, xxiii, p. 371]. During the same year some 13,000 acres were planted with treated Lima bean seed in the region under observation, compared with 1,500 and under 20 in 1942 and 1941, respectively.

HEINZE (K.). **Die Feldbereinigungen bei Sojakulturen als Schutzmassnahme gegen die Ausbreitung des virösen Sojamosaiks. Vorl. Mitt.** [Field sanitation in Soy-bean plantings as a prophylactic measure against the spread of the Soy-bean mosaic virus. Preliminary note.]—*Züchter*, xiv, pp. 254–258, 1942. [Abs. in *Gartenbauwiss.* (Ref.), xviii, 1, p. 23, 1943.]

The most destructive disease of soy-beans, especially of the yellow varieties, in Germany is mosaic [*R.A.M.*, xxii, p. 90], which necessitates stringent field sanitation to prevent the perpetuation of the virus by the seed of infected plants. This mode of control involves repeated inspections, which were undertaken by the writer [? in 1942] in three experimental fields, at the Biological Institute, Dahlem, Berlin, near Vienna, and in the Warthe District. The first count, four to five weeks after sowing, revealed an incidence of 23 per cent. diseased plants, which rose sharply during the summer owing to the exceptional prevalence of aphids. There was a marked difference between the plots from which the infected plants had been eliminated and the untreated controls. Investigations are in progress to determine whether late-season infections involve the seed. Soy-bean mosaic appears to be more widespread in eastern Germany than in other parts of the country.

WALKER (J. C.), JONES (H. A.), & CLARKE (A. E.). **Smut resistance in an Allium species hybrid.**—*J. agric. Res.*, lxix, 1, pp. 1–8, 1944.

Since Jones and Clarke obtained a fertile amphidiploid from a cross between *Allium fistulosum* and the onion (*J. Hered.*, xxxiii, pp. 25–32, 1942), the former is a source of resistance to onion smut (*Urocystis cepulae*) [*R.A.M.*, xxii, p. 6] capable of being incorporated into commercial onion varieties by breeding.

In 1936–7, 1,844 plants of the Nebuka strain of *A. fistulosum* [ibid., xii, p. 416] were tested for resistance, and only 111 or 6 per cent. developed lesions, all of which were above the crotch, where they did little injury, the attacked seedlings being able to survive. Of the three onion varieties grown as controls, Ebenezer showed 86·4 per cent. diseased, Sweet Spanish 73·2, and Early Grano 68·5. In 1938–9, Nebuka again proved highly resistant, only 0·9 per cent. developing lesions below the crotch, as against 74·9 per cent. for seven onion varieties. The hybrids between onion and Nebuka also showed considerable resistance, only 13·7 per cent. of these plants developing lesions below the crotch.

In 1939–40, the percentages of seedlings developing lesions below the crotch were 0·6, 61·2, and 8·7 for Nebuka, onion, and their F_1 hybrids, respectively. The F_1 hybrids were self-sterile so that no F_2 populations were obtained. The first and second back-cross generations to *A. cepa* were as severely infected as the original commercial varieties used in the crosses.

In the 1941–2 tests, Nebuka had 0·5 per cent. plants with lesions below the crotch, as against 81·3 per cent. for Yellow Globe Danvers onion and 82·1 per cent. for the back-cross populations.

In 1941, two populations of the fertile amphidiploid, obtained from a cross between Australian brown onion and Nebuka, were tested. One was a P_2 population obtained by selfing the original amphidiploid, while the other was a mixture of P_3 progenies from these plants. None of the Nebuka plants smutted below the crotch, though 98·8 per cent. of Yellow Globe Danvers became infected. The amphidiploid was intermediate in its reaction, 38 per cent. of the P_2 and 59·1 of the P_3 populations becoming infected below the crotch. The partial resistance of the amphidiploid was confirmed by a later test. Since back-crossing has not so far been very successful it may be that the utilization of the fertile amphidiploid will prove more satisfactory.

TIMS (E. C.). **Some diseases of Onions grown for seed in Louisiana.**—*Plant Dis. Reptr*, xxviii, 19, pp. 633–634, 1944. [Mimeographed.]

The limiting factor in the growing of onion seed in the southern part of Louisiana is stated to be the occurrence of stalk rot diseases: mildew (*Peronospora destructor*) [*R.A.M.*, xxii, p. 336], purple blotch (*Macrosporium* [*Alternaria*] *porri*) [ibid., xvii, p. 654], and black stalk rot (*M. parasiticum*) [*Pleospora herbarum*: ibid., xxiii, p. 208], all of which develop chiefly during blossoming and seed-setting time. In addition, a serious root rot, often associated with pink root (*Phoma terrestris*) [ibid., xxi, p. 117], was observed in some fields during the past season causing a dying-off of the seed stalks. The stalk-rot diseases often overlap and may all occur on the same seed stalk. The most serious disease among them is considered to be mildew which, in 1943, almost destroyed the onions in certain areas of the State. A blasting of the seed heads, of obscure etiology, is a serious problem in certain seasons and caused losses of 40 to 50 per cent. in one or two fields in 1944. Many strong seed stalks produced practically no seed.

HOOKER (W. J.). **Comparative studies of two Carrot leaf diseases.**—*Phytopathology*, xxxiv, 6, pp. 606–612, 1 fig., 1 graph, 1944.

Differences in the seasonal cycles of two carrot leaf diseases caused, respectively, by *Cercospora carotae* and *Macrosporium carotae* [*R.A.M.*, xxiii, p. 420],

have been observed in Wisconsin and reported from Massachusetts [ibid., viii, p. 352]. Studies were accordingly carried out in the former State to determine whether the variations in prevalence of the two pathogens, *C. carotae* being rife in July and early August and *M. carotae* reaching a climax during August and throughout September, were explicable on the basis of differential reactions to temperature and leaf age.

The spores of both organisms germinated over a wide temperature range, with an optimum in each case at 28° C. At 16° the progress of infection by both fungi was retarded, while with rising temperatures up to 24° it was accelerated [loc. cit.: see also ibid., xxii, p. 286]. Temperature, therefore, is evidently not the decisive factor in the early development of *C. carotae* and the late appearance of *M. carotae*. On the other hand, there was a striking contrast between the two fungi in respect of preference for young or old foliage, *C. carotae* predominating on the former and *M. carotae* on the latter. These divergences in the host-parasite relations are thought to be largely accountable for the above-mentioned seasonal differences in the development of the two diseases under observation.

MAIER (W.). **Eine Bormangelkrankheit des Sellerie (Apium graveolens L. var. rapaceum (Mill.) DC.).** [A boron deficiency disease of Celeriac (*Apium graveolens* L. var. *rapaceum* (Mill.) DC.).]—*Gartenbauwiss.*, xviii, 1, pp. 47–58, 10 figs., 1943.

The author's studies on a boron deficiency disease of celeriac [*R.A.M.*, xxii, pp. 111, 192], hitherto unknown in Germany, at the Geisenheim (Rhine) Horticultural Experiment Station are fully described. The symptoms of the disorder, which affects the leaves, rootstocks, and roots, are in general agreement with those already reported in connexion with beet heart and dry rot [ibid., xi, p. 147 *et passim*]; they were reproduced in water culture experiments in plants deprived of boron in the nutrient solution. The trouble is responsible for heavy reductions in the crop owing to the small size of the rootstocks and their intersection by necrotic tissue. In one test the rootstock and leaf yields were increased 3 and 3½ times, respectively, by the application to the soil of 4 gm. borax per sq. m., a further advantage of the treatment lying in the pure white flesh of the perfectly sound rootstocks. Analyses of the 1942 crop from two localities revealed a lower boron content in the diseased than in the healthy plants, the most striking disparities occurring in the foliage.

THOMPSON (R. C.). **Reaction of Lactuca species to the Aster yellows virus under field conditions.**—*J. agric. Res.*, lxix, 3, pp. 119–125, 1944.

The losses caused by the aster yellows virus to lettuce crops [*R.A.M.*, xxii, p. 382] in certain localities in the eastern part of the United States are stated to amount to as much as 30 per cent. in some seasons, the disease growing increasingly more serious. In field trials initiated in 1935 at the Bureau of Plant Industry Station at Beltsville, Maryland, none of the 200 varieties and strains of cultivated lettuce showed any degree of resistance to the virus, while among the 22 wild species and strains of *Lactuca* tested, only two strains of *L. serriola* and two of *L. saligna* gave promise of value in breeding work, as they both showed marked ability to escape infection and crossed readily with cultivated lettuce. *L. tatarica*, *L. bourgaei*, and *L. marschallii* appeared to be immune from the virus, and the 17-chromosome species (*L. canadensis*, *L. spicata*, *L. graminifolia*, and *L. floridana*) as a group indicated some resistance, but all of these are genetically incompatible with the cultivated form and therefore valueless for breeding. *L. virosa* and *L. squarrosa* were highly susceptible.

FORSBERG (J. L.), OLSON (E.), & BINKLEY (A. M.). **Experiments with Pea seed treatments in Colorado.**—*Phytopathology*, xxxiv, 8, pp. 753–759, 1944.

A tabulated survey is given of experiments in the disinfection of pea seed of the Alaska, Perfection, Wisconsin Sweet, Green Admiral, Little Marvel, and Rogers' 95 varieties in northern Colorado and the San Luis and Arkansas Valleys with new improved ceresan (1 oz. per bush.), spergon, arasan, and yellow cuprocide (all at 2 oz.) [*R.A.M.*, xxiii, p. 511]. The root-rotting fungi concerned in the stand reductions against which the treatments were directed included *Fusarium solani* var. *martii* f. 2 (the most prevalent), *Ascochyta pinodella*, *Pythium* sp., and *Corticium vagum* var. *solani* (*Rhizoctonia solani*) [*C. solani*]. All the preparations increased emergence, spergon and new improved ceresan leading in most of the tests, but pending further studies on the factors governing their efficacy, no specific recommendations in favour of any of the four are made at this juncture.

HEDGES (FLORENCE). **Association of Xanthomonas phaseoli and the common Bean-mosaic virus, Marmor phaseoli. I. Effect on pathogenicity of the seed-borne infective agents.**—*Phytopathology*, xxxiv, 7, pp. 662–693, 2 figs., 1944.

A full account is given of the writer's exhaustive studies at the Plant Industry Station, Beltsville, Maryland, on the effect of the association of *Xanthomonas phaseoli* and the bean mosaic virus on the pathogenicity of these two seed-borne organisms. The discovery of the connexion was originally made by W. J. Zaumeyer in the course of tests for mosaic resistance on a bean hybrid, later known as US. No. 5 Refugee, on the primary leaves of which, rubbed with the expressed juice of mosaic-infected trifoliate bean leaves, extensive typical lesions of *X. phaseoli* developed. The writer found virulent *X. phaseoli* and a less pathogenic yellow variant of the same occurring in a masked form in trifoliate bean leaves showing only common mosaic symptoms.

In one experiment, in which Stringless Green Refugee was inoculated with single-colony cultures of two bacterial isolates, viz., 'typical' *X. phaseoli* from the lesions on primary leaves and its variant masked in the trifoliate leaves, 75 per cent. typical mosaic developed, the bacteria apparently acting as carriers of the virus. The 'typical' *X. phaseoli* produced 100 per cent. bacterial infection on the same Stringless Green Refugee plants and also on the mosaic-immune Corbett Refugee, while the mildly pathogenic variant attacked the latter variety only. The 'typical' *X. phaseoli* retained its apparent capacity to cause mosaic for at least six weeks in stock cultures on steamed potato cylinders, held for about a fortnight of this period at laboratory temperatures. All published records denote that one to two days is the limit of longevity of the bean mosaic virus in expressed juice at room temperatures. The yellow variant, after losing its apparent initial ability to produce mosaic, was able to cause bacterial blight of the hitherto immune Stringless Green Refugee.

Serial passages of juice containing both pathogens revealed the dominance of the virus and a marked increase in the incidence and severity of mosaic infection. With the 38th consecutive passage, 100 per cent. extreme dwarfing and bunching was accompanied by the reduction of most of the trifoliate leaves to a minute filiform state consisting of barely more than the midribs. This ultra-virulent form of mosaic persisted throughout the remainder of the 50 or so passages comprised in the trials. Acute derangement of the metabolism was expressed by the striking discoloration and prominent veining of the primary leaves, and of the large trifoliate ones (if any). Only a few plants produced flowers.

Bacterial symptoms in the serial passages were in general somewhat inconspicuous, and disappeared abruptly just before the sudden onset of the ultra-severe form of mosaic. They recurred on the inoculated primary leaves only after ten serial

passages. Virulent isolates of apparently 'typical' *X. phaseoli* were readily obtained from the serial passages as long as the symptoms were manifest, but after their disappearance colonies of a smooth (S), opaque, white, mildly pathogenic form developed in increasing numbers on the plates, while smooth, pink colonies were also produced sporadically. Subsequent studies, intended for future publication, showed both these forms to be variants of the virulent *X. phaseoli*. An occasional set of plates contained colonies of *X. phaseoli* which were dissociating in a remarkable manner into S white and S yellow. The aberrant forms ranged from S yellow colonies with S white, marginal, fan-shaped out-thrusts to those in which the entire periphery was S white, while the S yellow component was reduced to a central area resembling a three- or four-petalled flower.

JONES (L. H.). **Relations of weather conditions to Onion blast.**—*Plant Physiol.*, xix, 1, pp. 139–147, 1 fig., 1 diag., 1944.

'Blast', a physiological disease of onion leaves of the sun-scald type, is attributed to the inability of the plant rapidly to adjust itself to a combination of bright sunshine, high temperature, and low relative humidity following a period of cloudy, wet weather accompanied by high temperature and high relative humidity. Under these conditions the leaves turn white from the tips downwards in a few hours, or in milder cases develop a white spotting round the stomata which gradually expands as the leaf dies back from the apex. Considerable damage ensues if fine weather persists, but a recurrence of cloud may assist the plants, which are characterized by an excess of soft tissue and an abnormally small root system, to maintain an equilibrium between the amount of water absorbed and that lost through transpiration. The extent and severity of the disease are dependent on the reciprocal intensity of the two environments and on the stage of development of the crop.

Field observations in Massachusetts, where 'blast' was serious in seven years between 1925 and 1940, viz., 1927, 1928, 1931, 1935, 1937, 1938, and 1940, were supplemented and confirmed by laboratory tests in which the disorder was produced at will by simulated environmental combinations. The latter could be illustrated by means of a specially devised apparatus of superimposed dials, each adjustable according to the particular weather factor represented.

DARLINGTON (C. D.). **Paracrinkle virus and inheritance.**—*Nature, Lond.*, cliv, 3911, p. 489, 1944.

This is the author's reply to the criticism made by Carson and his co-workers [*R.A.M.*, xxiii, p. 472] of his paper on virus and plasmagenes [loc. cit.].

Service and regulatory announcements, April to June, 1944. Announcement relating to flag smut quarantine (No. 59).—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 33–35, 1944.

A temporary national shortage of foodstuffs and rail transport facilities in the United States has necessitated the importation of wheat from Australia, the existing prohibition against which under quarantine No. 59 on account of flag smut [*Urocystis tritici*: *R.A.M.*, v, p. 320] is modified by the present amendment, dated 9th June, 1944, to permit the entry through the port of Los Angeles of a quantity not exceeding six boatloads before 30th November, 1944, from the southern part of the country, where the disease does not appear to have been reported since 1941. The imported wheat is to be used solely as fodder and limited to an area of southern California where the crop is not of economic importance.

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CUNNINGHAM (H. S.). **Lima Bean seed treatment on Long Island.**—*Phytopathology*, xxxiv, 9, pp. 790–798, 2 graphs, 1944.

A tabulated survey is given of five years' seed treatment experiments on Lima beans [*Phaseolus lunatus*] at the Long Island Vegetable Research Farm, the results of which are not considered to warrant the recommendation of the practice as likely to be profitable on a commercial scale. Most of the preparations tested, however, notably spergon, improved the stands under exceptionally dry weather conditions and showed some value as seed-protectants.

WAGER (V. A.). **Bacterial wilt of the Egg-plant.**—*Fmg S. Afr.*, xix, 223, pp. 661–664, 3 figs., 1944.

In many parts of South Africa *Bacterium* [*Xanthomonas*] *solanacearum* is a limiting factor in eggplant production, and in some areas the disease has become so serious that neither potatoes nor tomatoes can be grown. In laboratory tests the tree tomato [*Cyphomandra betacea*] and certain chilli varieties also wilted after inoculation. Peanuts are susceptible, but the small Spanish type or Natal common two-kernel peanut is reported to be more resistant than the Virginia Bunch variety. Under the conditions prevailing in South Africa tobacco appears to be immune. Spread commonly occurs through the carriage of infected soil from one farm or field to another and through the use of infected seed potatoes. As the bacteria rapidly succumb to drying, they are not likely to be wind-borne.

The disease is observed only during summer, soil temperatures of over 60° F. being necessary for its development. Thus, in most areas it is almost impossible to grow eggplants, tomatoes, or potatoes in summer, but where no frosts are experienced, good crops of these vegetables can be grown in winter, even in infected soil.

The only method of control at present available is to keep the disease away from new lands. No susceptible crop should be planted in infected soil for several years. Only healthy seed potatoes should be used, and tomato or eggplant seed should be planted in virgin soil or in soil sterilized by baking in an oven or by building a fire over the seed-beds.

In laboratory tests with tomato varieties reported from various countries as resistant only Matale and Kopek showed high resistance, but the former was very susceptible when planted in an infected field.

VAUGHAN (E. K.). **Peanut seed treatment in Virginia—1944.**—*Plant Dis. Reptr*, xxviii, 21, pp. 672–675, 1944. [Mimeographed.]

In tests carried out in Virginia in 1943 with the co-operation of growers, greatly improved stands resulted from the treatment of groundnut seed with arasan (2 oz. per 100 lb.), particularly where soil and climatic conditions were unfavourable and where machine-shelled seed was used. Thus, in Greensville County, in seven tests, the percentage increases in stand (machine-shelled seed) due to the treatment were

112, 34, 41, 14, 279, 295, and 171 per cent., while in Sussex County in 17 tests (hand- and machine-shelled) they ranged from 21 to 324 per cent. Taking all the localities together, the hand-shelled and machine-shelled seed showed, respectively, 38·5 and 99·2 per cent. increase in stand due to the treatment.

In another series of tests, using machine-shelled seed, arasan (50 per cent. tetramethyl-thiuram disulphide), 2 per cent. ceresan (2 per cent. ethyl mercury chloride), and spergon (98 per cent. tetrachloro-para-benzoquinone) gave, respectively, 100·3, 94, and 66·6 per cent. increase in stand (average for 14 tests with each material).

CARSNER (E.). **The term viruliferous.**—*Phytopathology*, xxxiv, 8, pp. 766–768, 1944.

The term 'viruliferous', as applied to the insect vectors of plant diseases by Carsner and Stahl [*R.A.M.*, iv, p. 76], has come into general and appropriate use in the phytopathological literature in this correct sense, but of late several instances of its misapplication have been noted. Thus Valleau has referred to plant tissue as 'viruliferous' [ibid., xx, p. 600; xxii, p. 181], and his usage has been adopted by F. Johnson and L. K. Jones [ibid., xxiii, p. 421]. In this way the predominating notion of movement, implicit in the word 'viruliferous', is quite lost, and the original precise meaning of the term is corrupted. Another innovation deprecated by the writer is the substitution by Frampton *et al.* [ibid., xxii, p. 75] of the older medical term 'viriferous' for 'viruliferous'.

DU PLESSIS (S. J.). **Powdery mildew or Oidium-disease of the Vine.**—*Fmg S. Afr.*, xix, 223, pp. 641–648, 668, 4 figs., 2 graphs, 1944.

In South Africa the most critical period for infection of vines by powdery mildew [*Uncinula necator*: *R.A.M.*, xxiii, p. 251] is from the beginning of November until the middle of December. Experimental data on the Riesling variety clearly indicated that winter spraying with lime-sulphur (1 in 8) did not, in itself, reduce the incidence of the disease, and this result was repeatedly confirmed by tests made from 1939 to 1942 on Bottelary, Banhoek, and Groot-Drakenstein vines.

In comparative tests with Bordeaux mixture [cf. ibid., xxiii, p. 327], a manganese-sulphate-lime mixture, and sulphur, the last-named consistently gave the best results, which were so outstanding that the use of anything except sulphur against *U. necator* is definitely not recommended. Lime treatments were totally ineffective, while additions of lime to sulphur reduced the fungicidal activity of the sulphur.

It was found that diluting 'lightning' sulphur with up to 20 per cent. kaolin did not reduce fungicidal efficiency. While particularly refined sulphurs are not necessary against *U. necator*, the mixtures used should, as a rule, contain at least 90 per cent. sulphur; mixtures with up to 80 per cent. are allowable only if care is taken to spread the sulphur well over all the vines. Fewer but more thorough applications are preferable to six or seven weak treatments.

Experimental evidence showed that sulphur applications made in October and November are the most valuable. Further, the three summer treatments carried out (October to December) also gave the best results against anthracnose [*Elsinoe ampelina*] and leaf spot diseases [unspecified] in most areas, including Transvaal and the Orange River irrigation area. Sulphur is also effective against leaf spots due to *Isariopsis* [*fuckelii*: ibid., xxii, p. 89] and *Exosporium*. The regular execution of a standard dusting programme in which sulphur is applied during summer, with a supplementary winter spraying where anthracnose occurs, is strongly recommended.

When weather conditions are promising and the vines are only slightly damp with dew, dusting should be carried out before breakfast. Treatments, though thorough, must be as light as possible, to avoid sulphur scalds.

EASTHAM (A.) & BRETT (C. C.). **The Official Seed Testing Station for England and Wales. Twenty-second Annual Report covering the period 1st August, 1938–31st July, 1939.**—*J. nat. Inst. agric. Bot.*, v, 1, pp. 105–113, 1944.

During the period under review the percentage (1·6) of wheat samples containing bunt (*Tilletia caries*) 'balls' is lower than in any previous season on record, and that of barley [covered] smut (*Ustilago hordei*) lower than in any of the five preceding years. Ergot (*Claviceps purpurea*), however, was higher in rye (28·1 per cent.) than in any year since 1928–9, the incidence of this disease having risen progressively since 1934–5; the corresponding figure for 1937–8 was 23·8. The same fungus caused only 0·2 per cent. infection in wheat.

Of 36 samples of celery seed examined for the presence of *Septoria apii* and *Phoma apiicola* [*R.A.M.*, xi, p. 91], 28 were infected by the former and 18 by the latter.

[WATERSTON (J. M.).] **Plant pathology.**—*Rep. Dep. Agric. Bermuda, 1943*, pp. 7–8, 1944.

The so-called 'blight' of Bermuda cedar [*Juniperus bermudiana*] referred to in the previous year's report [*R.A.M.*, xxiii, p. 6] was shown during 1943 to be an entomological problem. Among the new fungal records may be mentioned *Delacroixia coronata* (Cost.) Sacc. & Syd., an occupant of *J. bermudiana* foliage that preys on the dry wood termite (*Kalotermes approximatus*) under humid conditions; *Microsphaera euphorbiae* on *Hibiscus sabdariffa*; *Uromyces dolicholi* on *Cajanus cajan*; *Erysiphe graminis* on barley; and *Bacillus phytophthorus* [*Erwinia phytophthora*] on Sebago seed potatoes imported from Maine. New host records include *Sclerotinia sclerotiorum* on *C. cajan* pods and *Cephaleuros mycoidea* on pimento leaves.

Mention is made on p. 6 of a trial of oats resistant to crown rust (*Puccinia coronata*) supplied by T. R. Stanton of the United States Department of Agriculture. Four varieties proved to be immune from the disease under the experimental conditions, namely, Bond (2733), Sac (3907), Bond × Fulghum (4076), and Bond × Alber. Crown rust being the chief obstacle to the cultivation of oats as a green fodder crop, a large supply of Sac was procured for extensive trials in 1944.

Science for the farmer.—*Rep. Pa agric. Exp. Sta., 1943–44* (*Bull.* 464), 40 pp., 12 figs., 1944.

On p. 11 of this report [cf. *R.A.M.*, xxiii, p. 167] it is stated that several [unnamed] potato varieties immune from blight [*Phytophthora infestans*], bred by W. R. Mills, gave yields of over 200 bush. per acre, though the season was hot and dry, and yields in general were low.

On p. 18 it is stated that fermate at 1 lb. per 100 gals. plus 1 lb. dry-wettable sulphur in the pink, petal-fall, and first cover sprays gave excellent control of cedar rust [*Gymnosporangium juniperi-virginianae*] on York Imperial apples.

STEVENSON (J. A.) & WELLMAN (F. L.). **A preliminary account of the plant diseases of El Salvador.**—*J. Wash. Acad. Sci.*, xxxiv, 8, pp. 259–268, 1944.

This annotated list of diseases of economic plants collected in Salvador during the period May to the middle of August, 1943, contains, among many others, the following records. Onions and leeks showed black mould and purplish lesions on the leaves due to *Alternaria porri*. Beet leaves showed the presence of *Cercospora beticola*. *C. capsici* and *C. diffusa* were found on leaves of *Capsicum frutescens*. *Carica papaya* showed powdery mildew (*Oidium caricae*) and the leaf spot due to *Pucciniopsis caricae*. *Colletotrichum coffeanum* [*Glomerella cingulata*] was noted on coffee leaves and *A. carotae* on carrot leaves. Fig rust (*Physopella fici*) [*?Phakopsora nishidana*: *R.A.M.*, xvii, p. 841] was present in the uredo stage only. *Mycosphaerella*

fragariae was found on strawberry (*Fragaria chiloensis*), in its conidial state, *Ramularia tulasnei*. *Cladosporium fulvum* and *Septoria lycopersici* were common on tomato, *Cercospora musae* occurred on banana, and *Claviceps paspali* on *Paspalum* sp. *A. vitis* was associated with vine leaf spots. Among maize diseases found, *Nigrospora oryzae* and *Physoderma zeae-maydis* [*P. maydis*] may be mentioned.

BROWN (J. G.) & BOYLE (ALICE M.). **Effect of penicillin on a plant pathogen.**—*Phytopathology*, xxxiv, 8, pp. 760–761, 1 fig., 1944.

Penicillin was produced by *Penicillium notatum* on a modified Czapek-Dox and maize grain decoction in an apparatus based on that described by Clifton (*Science*, N.S., xcviii, pp. 67–70, 1943) and tested at the Arizona Agricultural Experiment Station for its bactericidal action on the destructive Gram-positive parasite, *Erwinia carnegieana*, of the giant cactus [*Carnegiea gigantea*]. The anti-bacterial substance was found to exert a similar inhibitory effect on the plant pathogen to that observed in plates of *Staphylococcus aureus* in a comparative series of tests [cf. *R.A.M.*, xxiii, p. 56]. Indications were further obtained that *Corynebacterium sepedonicum*, the agent of potato ring rot, is also susceptible to penicillin.

BAKER (R. E. D.) & DALE (W. T.). **Witches' broom disease investigations. X. Loss of pods in I.C.S. clones at River Estate during 1943. XI. Observations on the effect of planting interval on witches' broom disease at River Estate.**—*Trop. Agriculture, Trin.*, xxi, 10, pp. 196–198; 198–199, 1944.

In further work on cacao witches' broom [*Marasmius perniciosus*: *R.A.M.*, xxiv, p. 9] in Trinidad, the clones of I.C. Selections under trial in field 7 were examined for the first time for pod resistance in 1943. Of 17,364 pods harvested from Set I (I.C.S. 1, 3, 4, 5, 6, and 8), II (I.C.S. 1, 7, 16, 22, 45, and 53), and III (I.C.S. 1, 2, 9, 12, 60, and 98), 1,757 or 10 per cent. were affected. In this field strenuous attempts at control had been made, but in the adjoining field, where no control had been undertaken, the loss amounted to 44 per cent. The total yield for Set I was 5,024 pods, of which 2,983 were harvested in July and August, with 2 per cent. infection present. It is apparent that the clones in Set I, except I.C.S. 3, showed a considerable degree of disease avoidance, setting most of their crop during the dry months, when severe infection was impossible. In the remainder of the year Set I gave 2,041 pods, with 30 per cent. infection. Of these six clones, I.C.S. 1, 4, and 6 appear to show more resistance than I.C.S. 3, 5, and 8. This difference, if significant, could be due to true resistance. Two of the clones, I.C.S. 1 and 6, in this more resistant group are very promising. In Sets II and III, all the clones except I.C.S. 7, which appears to be a very poor one, show considerable disease avoidance. Considering all the clones together, I.C.S. 1, 4, 6, 45, and 98 show some promise of resistance in addition to avoidance; I.C.S. 2, 7, 9, 12, 53, and 60 are doubtful; and I.C.S. 3, 5, 8, 16, and 22 are poor. I.C.S. 1, 6, and 45 are also promising for high yield, high pod value, and quality.

It is pointed out that these results must be viewed with caution as yet, since they are rather at variance with those from seedling trees [loc. cit.] where no evidence of pod resistance was found.

In the second paper experimental results are given which do not support the view that close planting reduces pod infections, but do suggest that close-planted trees stand up better to the disease and yield much more heavily than widely spaced trees.

STEVENSON (J. A.) & JOHNSON (A. G.). **Nomenclature of the cereal smut fungi.**—*Plant Dis. Reptr*, xxviii, 20, pp. 663–670, 1944. [Mimeographed.]

The acceptance in 1940 of the International Rules of Botanical Nomenclature by the United States Department of Agriculture and the Bureau of Plant Industry

has made it necessary to change some of the names commonly used in American mycological practice. The names of cereal smuts presented here are those that appear to be applicable under the Rules, as interpreted by the authors, after all possible consideration has been given to the opinions and suggestions of mycologists interested in the group both in the United States and Canada and in Great Britain, to whom preliminary lists had been submitted for criticism. In each case the pertinent synonymy is given and comment offered in some cases to explain the reasons for the decisions made. *Sphacelotheca destruens* is accepted for millet smut, and it is pointed out that Persoon's subspecific name *panici-miliacei* cannot be legitimately used for this species, since the specific epithet *destruens* is available and must be taken up under the provisions of Article 58 of the Rules. *Tilletia caries* is accepted in place of *T. tritici*, *T. foetida* in place of *T. foetens* or *T. levis*, *Ustilago kolleri* in place of *U. levis* in accordance with Article 58, and *U. maydis* in place of *U. zeae*, the specific epithet *zeae* being rejected as pre-Persoonian and neither De Candolle's varietal name *mays-zeae* being available under Article 58 nor the binomial *Uredo zeae-mays*, as cited by Ciferri.

LEACH (W.). **Studies on the metabolism of cereal grains. III. The influence of atmospheric humidity and mould infection on the carbon dioxide output of Wheat.**—*Canad. J. Res.*, Sect. C, xxii, 4, pp. 150–161, 5 graphs, 1944.

In the present study, conducted at Winnipeg, Manitoba, weighed lots of about 30 grains of Renown wheat with an initial moisture content of 10 per cent. were placed in the upper dish in the catharometer plant chamber, while a measured amount of distilled water, sufficient to raise the water content of the grain as desired, was added to the filter paper in the lower dish; the plant chamber was then sealed up, placed in the 25° C. thermostat bath, and, after a two- or three-hour settling-down period, the carbon dioxide records were made, the grain weighed, and its final moisture content calculated [the procedure is described]. The data obtained showed that, with the final moisture content below 20 per cent., the respiration rate of the wheat grains increased only very slowly over an experimental period of about 100 hours, whereas with the final moisture content rising above 20 per cent. the respiration rate showed a marked and steadily increasing acceleration. The removal of the embryos, the main seat of metabolic activity, from the wheat kernels did not, contrary to expectation, lower the carbon dioxide production, but instead resulted in a more rapid acceleration of respiration. This is interpreted as a definite proof that the rise in carbon dioxide production in damp wheat (when unlimited absorption of water and germination are prevented) is due, not to respiration of the grain itself, but to that of contaminating micro-organisms, which in the present study appear to be mainly fungi (predominantly species of *Penicillium*, *Aspergillus*, and *Fusarium*, also *Cladosporium herbarum*, types of *Alternaria tenuis*, various yeasts, and *Monilia*). Throughout all the experiments a distinct fungous growth was observed on both whole and de-germed wheat grains, where the final moisture content of the grain was not lower than 19 per cent. This growth was more abundant on grain with a higher moisture content than on that with a lower one.

To examine the effect of atmospheric moisture on the growth of moulds contaminating grain the experimental procedure was adapted as follows. Wheat with an initial moisture content of 12·45 per cent. was placed in the upper dish and 2 c.c. of a saturated solution of one of several salts selected to bring the relative humidity of the air to certain predetermined values in the lower. The data obtained showed that mould growth was practically inhibited when the relative humidity of the air surrounding the grain was about 90·7 per cent., while it persisted and continued to increase in rate of growth as well as of carbon dioxide production when the humidity was raised to 93 per cent. and above.

Ho (W. C.). **Soil-inhabiting fungi attacking the roots of Maize.**—*Res. Bull. Ia agric. Exp. Sta.* 332, pp. 403–446, 6 figs., 1944.

In a study of the pathogens attacking maize seeds and seedlings the organisms most frequently found on decayed seeds were *Pythium debaryanum, Gibberella saubinetii* [*G. zeae*], *Penicillium oxalicum, Trichoderma lignorum* [*T. viride*], and *Fusarium* spp. Those noted on diseased roots were *Pythium debaryanum, P. graminicola, G. zeae, Helminthosporium sativum, Rhizoctonia* [*Corticium*] *solani, T. viride, Fusarium moniliforme* [*G. fujikuroi*], and *Fusarium* spp. Isolations from infected mesocotyls gave mainly *G. zeae, C. solani, H. sativum, Penicillium oxalicum, T. viride,* and *Fusarium* spp., while those from diseased plumules yielded *G. zeae, F.* spp., and *Rhizopus* spp. *Diplodia zeae* and *G. fujikuroi* were present on the crowns.

These organisms fall into three groups based on their pathogenicity to maize in the greenhouse and field; (*a*) highly destructive: *Pythium debaryanum, P. graminicola,* and *G. zeae*; (*b*) moderately destructive: *C. solani, H. sativum,* and *Penicillium oxalicum*; (*c*) slightly destructive: *Aspergillus niger, G. fujikuroi, T. viride, Rhizopus* sp., and *Fusarium* spp.

Greenhouse and field data indicated that *Pythium debaryanum* caused heavy seed decay, particularly when the soil temperature was under 16° C. and the soil moisture content reached 70 per cent. or over. In one test, for example, seed of inbred Black 345 maize planted in the laboratory in naturally infected soil kept at 15° subsequently showed 60 to 100 per cent. decay, as against only about 5 per cent. for the seeds in the control pots. Of the isolates obtained from these decayed seeds 61 per cent. were *P. debaryanum.* Small, necrotic lesions were found on the roots of the seedlings from the infected soil, but those of the seedlings from the control pots showed no trace of infection: *P. debaryanum* was frequently isolated from these lesions. Inoculations with these cultures induced similar root injuries, the pathogen being re-isolated from the infected tissue. *G. zeae* and *P. graminicola* also caused considerable decay in cases where *P. debaryanum* was scarce or inactive in the soil. *P. graminicola* was isolated frequently from roots, but only occasionally from decayed seed. In one laboratory test inbred Lancaster 317 seed was planted in naturally infected soil and germination was about 49 per cent. lower at 15° than at 26°, though in the control pots, containing steamed soil, there was no marked difference as between the two temperatures. Isolations from the infected seeds yielded *P. graminicola, P. debaryanum, G. zeae, T. viride, G. fujikuroi,* and *Fusarium* spp. Necrotic lesions on the root tips of the plants taken from the infested soil were more distinct in the 26° than in the 15° series. All isolates from the infected root tips were *P. graminicola.* This fungus appeared to cause more seed decay at low than high temperatures, while root infection appeared to be favoured by high temperatures. Field tests gave similar results. Temperature specifically influences the amount of infection and the subsequent development of the disease caused by *P. graminicola.*

G. zeae was the organism most commonly isolated from the necrotic lesions on roots and mesocotyls of seedlings, and was observed frequently on the pericarp of decayed seed. It was often associated with, or followed injury by, *P. graminicola.*

Most strains of *H. sativum* were only slightly pathogenic, but one strain (isolate 9035) repeatedly caused severe stunting and blighting of maize seedlings in the greenhouse. Under field conditions these symptoms were often marked by those already produced by more aggressive pathogens. The other organisms mentioned, except one strain of *C. solani,* were secondary invaders or saprophytes.

P. debaryanum was ascertained to become parasitic before and after emergence, during the second half of May, causing seed decay, stunted growth, and tip necrosis on the primary and some of the seminal roots. As the season advanced

and the soil temperature rose, *P. graminicola* induced rapid necrosis, producing a brown, water-soaked appearance on the tips of most of the roots. At the same time, *G. zeae* and *C. solani* were often present on the lower part of the mesocotyl and later caused discoloration and necrosis of the roots. Other organisms, such as *H. sativum* and *Penicillium oxalicum*, later on produced further necrotic lesions on the mesocotyl and basal portion of the roots. Still later, *Fusarium* spp., *A. niger*, *T. viride*, and other soil saprophytes were isolated from lesions on the root and mesocotyl. This group often developed extensively, leaving no trace of the fungi that had prevailed earlier.

ROSEN (H. R.) & LARSH (H. W.). **Prevalence of Rhynchosporium scald on Barley in Arkansas in 1944.**—*Plant Dis. Reptr*, xxviii, 20, pp. 641–643, 1944. [Mimeographed.]

Rhynchosporium secalis [*R.A.M.*, xvii, p. 22], causing scald of barley, is stated to have been by far the most common and destructive disease of the winter crop in Arkansas in 1944. In nursery rows it appeared in abundance early in the season and was responsible for an estimated loss of from 50 to 75 per cent. of the leaf area of seedlings in the flag-leaf stage, and almost complete destruction of the leaf area in the milk stage. Of the varieties examined for leaf-area losses, 29 were highly susceptible and suffered the above-mentioned loss, while 12, including Tennessee Winter C.I 6034, showed some degree of resistance, their losses in leaf area ranging from a trace to 25 per cent. Under Arkansas conditions the early stage of infection took the form of dark brown spots and streaks which gradually become light brown to straw-coloured in the interior, delineated by a much darker brown, narrow margin. As far as is known the disease is not seed-borne, yet it was found that no infection occurred till late in the growing season in plots sown with seed treated with new improved ceresan.

BLISS (D. E.) & FAWCETT (H. S.). **The morphology and taxonomy of Alternaria citri.**—*Mycologia*, xxxvi, 5, pp. 469–502, 3 figs., 12 graphs, 1944.

Alternaria citri, described by Pierce in 1902, and accredited to Ellis and Pierce, is widely distributed throughout the temperate and subtropical zones, but appears to be unknown in tropical regions. Confusion regarding the morphological limits of the species has arisen because type specimens and illustrative material are lacking. Pierce (*Bot. Gaz.*, xxxiii, pp. 234–235, 1902) stated that single-spore cultures had been made, and that detailed descriptions and illustrations would be published, but these data do not appear ever to have seen the light, and as far as can be ascertained no fungous material studied by Ellis and Pierce is available. In the absence of such material uncertainty has arisen as to the characteristics and limits of the fungus, and as to the identity of related organisms. A photograph of Pierce's unpublished drawings (the only ones known to exist) of the black rot of oranges and of the spores of *A. citri* was lent to the authors by Mrs. Newton B. Pierce.

New evidence is presented on the morphology and taxonomy of the fungus, based on a statistical study of 26 isolates from Washington Navel orange, Deglet Noor date palm, and Holguin guava, from various parts of southern California, including some of the places where Pierce found his specimens. Marked differences appeared when transfers of the same isolate were cultured on different media, but there was much similarity between various isolates when cultured under uniform conditions on the same medium.

Measurements were made of 2,629 spores. On Czapek's agar isolates from citrus fruits produced spores 8·1 to 81 μ long, including beaks (86·9 per cent. measuring 10·4 to 37·3 μ long), and 6·3 to 24·3 μ wide (89·3 per cent. measuring 7·7 to 15·7 μ wide). The beaks measured up to 54 (90·7 per cent. up to 7·6) μ long. On maize

meal agar the spores were narrower, with longer beaks. On citrus fruit slices 93·8 per cent. of the spores were 10·4 to 26·5 μ long.

Transverse septa ranged from 0 to 11, commonly 1 to 4. On Czapek's agar, 40·6 to 51·5 per cent. of the spores had three transverse septa, but on citrus fruit slices under 25 per cent. had three septa and about 50 per cent. were 1-septate. Among 40,000 spores grown on the different media the following percentages were beaked: on citrus fruit slices, 31·1 to 37·8 per cent.; on Czapek's agar, 61·1 to 62·9 per cent.; and on maize meal agar, 84·9 to 87·5 per cent. The percentages of beaked spores were higher in cultures with long, straight spore chains than in those with short or branched chains. On maize meal agar the spore chains were longer than on Czapek's agar.

The chief differences between the authors' emended description and the original ones, and between the authors' illustrations and Pierce's are attributable to the effect of different substrates. Pierce's concept was based on the fungus as it appeared in or on orange fruits, the authors' on its appearance in culture. The fungus is best identified when freshly isolated cultures are observed under standard conditions. Examination of numerous isolates and herbarium specimens revealed large variations in spore size within individual cultures and specimens.

Species considered by the authors to be similar to *A. citri* are *Stemphylium citri* (probably identical), *Macrosporium citri*, *A. mali*, and *A. tenuis* as reported on figs by Brooks and McCulloch [*R.A.M.*, xvii, p. 538]. While retaining *A. tenuis* as the type species of the genus, the authors suggest that the short-spored, short-beaked species should be tentatively grouped about some other species, such as *A. citri*.

Tidd (J. S.). **California Citrus psorosis survey.**—*Plant Dis. Reptr*, xxviii, 20, pp. 638–640, 1944. [Mimeographed.]

The data from psorosis (type A) [*R.A.M.*, xxiii, p. 61] surveys in Californian orange groves collected during 1943 by H. A. Harris and in 1944 by the author show that the amount of diseased Navel and Valencia trees ranged from 0·45 to 29·87 per cent.; and the total estimated crop loss (both from psorosis-diseased as well as replanted trees, which produce a smaller crop than the older original trees) from 0·10 to 17·01 per cent. In general, the older groves showed a higher percentage of loss due to psorosis than the younger ones. It appeared that in older groves (Navel trees 35 to 50 years old and Valencias 25 to 27 years old) the average amount of fruit produced by a psorosis tree is about $\frac{1}{3}$ less than that produced by a normal, healthy one in the same age and variety group.

The stubborn disease of citrus [ibid., xxiii, p. 294] was encountered in none of the Valencia groves and in only three of the four Navel groves surveyed by the author. Scattered 'stubborn' trees in three different groves were estimated to produce from 30·1 to 49·5 per cent. less fruit than healthy ones.

Bliss (D. E.). **A new species of Alternaria on fruit of Phoenix dactylifera.**—*Mycologia*, xxxvi, 5, pp. 538–549, 2 figs., 1 graph, 1944.

A new species of *Alternaria*, associated with spoilage of date fruits in California, is named *A. stemphylioides* n.sp. On Czapek's agar it forms effused, dark olive to black colonies. The hyaline, septate, branched hyphae are 3 to 6 μ in diameter. The simple or branched, septate, slender conidiophores, not swollen at the apex, are 3 to 8 μ in diameter and up to 200 μ long, with thin-walled apical cells becoming dark brown, geniculate, scarred, and broader than the hyaline basal cells. The acrogenous, solitary, or 2-3-catenulate conidia are brownish-olive, darkening with age, opaque, oval, ovate, rotund, subangular, or obclavate, slightly constricted at the septa, muriform, with 0 to 9 (mostly 1 to 4) transverse and 0 to 3 longitudinal septa. They measure (including beak) 14 to 77 (mostly 16 to 28) by 10 to 17 μ, mean, 26·1 by 12·7 μ, and are non-beaked or beaked. Secondary

conidia are produced acrogenously on the beaks of primary conidia, these beaks becoming secondary conidiophores.

The percentages of beaked spores varied considerably on different media (e.g., from 1·5 per cent. on cultures in Czapek's agar with no sucrose to 28·8 per cent. when 3 per cent. sucrose was present). Size and septation were also affected by sugar content.

Although similar to certain species of *Stemphylium*, especially of the *Pseudostemphylium* group, the fungus is referred to *Alternaria* because of its beaked spores and unswollen conidiophores. From a taxonomic point of view it appears to occupy an intermediate position between the *A. citri* group of *Alternaria* and the *Pseudostemphylium* group of *Stemphylium*.

CUNNINGHAM (I. J.), SWAN (J. B.), & HOPKIRK (C. S. M.). **The symptoms of ergot poisoning in Sheep.**—*N.Z.J. Sci. Tech.*, A, xxvi, 3, pp. 121–124, 1944.

The outstanding symptoms in sheep experimentally fed on perennial rye grass infected by ergot (*Claviceps purpurea*) [*R.A.M.*, xxi, pp. 205, 452, and next abstracts] were inflammation and ulceration of the mucosa of the alimentary tract. Ergot poisoning, however, does not present a sufficiently characteristic picture to permit a diagnosis on the basis of symptoms and lesions alone: before a positive conclusion could be reached it would be necessary to demonstrate accessibility to the infected grass and the absence of other causes of gastroenteritis.

CUNNINGHAM (I. J.), MCINTOSH (I. G.), & SWAN (J. B.). **The non-toxicity of milk and meat from ergotized Cattle.**—*N.Z.J. Sci. Tech.*, A, xxvi, 3, pp. 125–136, 1944.

A detailed, tabulated account is given of chemical investigations and feeding experiments on various animals, the results of which showed that, even under the most favourable conditions for ergot (*Claviceps purpurea*) ingestion from the fodder grasses *Lolium perenne* [see preceding abstract] and *Festuca arundinacea*, the toxins were not transmitted to the milk or body tissues. It is concluded, therefore, that no risk to human health is incurred by the consumption of meat or milk from cattle that may have access to ergotized pasture grasses.

HASSALL (C. H.). **The alkaloidal constituents of New Zealand ergot.**—*N.Z.J. Sci. Tech.*, B, xxv, 4, pp. 169–174, 1944.

The methods of separation of the active constituents of a commercial sample of New Zealand ergot (*Claviceps purpurea*) containing material from both marram grass [*Psamma arenaria*] and tall fescue (*Festuca elatior*) [*R.A.M.*, xxi, pp. 205, 452 and preceding abstracts] are described, and its alkaloids identified as ergotaminine, ergotoxine, ergotamine, and a trace of ergosinine.

LAMY (L.). **Intensité et vitesse relatives de la formation des dispositifs capteurs chez les Hyphomycètes prédateurs de nématodes.** [Relative intensity and velocity of formation of the trapping apparatus in the Hyphomycetes preying on nematodes.]—*C.R. Soc. Biol., Paris*, cxxxvii, 11–12, pp. 337–339, 1943.

In two series of experiments at 20° to 22° C., one with hyphae from pure cultures and the other with mycelium from freshly germinating spores, the author determined the optimum concentrations of (*a*) horse serum and (*b*) *Lumbricus rubellus* extract for the formation of 'traps' by the nematode-destroying group of Hyphomycetes, notably *Dactyella bembicodes* [*R.A.M.*, xxiii, p. 436 and next abstract]. These were found to be about 1 in 10 for the former and 1 in 100 for the latter medium, the minima being 1 in 100 and 1 in 1,000, respectively, and the maximum for (*a*) between 1 in 2 and the pure serum. The capturing apparatus was formed

more rapidly, as well as in greater profusion, at the optimum concentration, e.g., after 16 hours on serum at 1 in 10 as compared with 25 at 1 in 2.

DESCHIENS (R.) & LAMY (L.). **Conditions pratiques de culture, de sporulation et de récolte des spores d'Hyphomycètes predateurs de nématodes.** [Practical conditions of culture, sporulation, and collection of the spores of Hyphomycetes preying on nematodes.]—*C.R. Soc. Biol., Paris*, cxxxvii, 11–12, pp. 381–383, 1943.

By means of the following simplified technique, the writers hope to extend the application of soil treatment with the spores of anti-larval fungi, e.g., *Arthrobotrys*, *Dactylella* (including *D. bembicodes* [see preceding abstract]), and *Dactylaria* spp., more especially against Strongyloid nematodes, to pastures, meadows, and other large areas. The organisms are grown at 25° C. from spores or from hyphae on agar squares in tubes on a medium consisting of 150 gm. maize seeds and 5 gm. malt extract (or 20 gm. maltose) per l. water sterilized for 15 minutes at 115°; the bouillon may also be prepared with beans, peas, or chick peas. Sporulation commences on the 15th day and reaches a maximum on the 30th, when the spores may be collected, dried in a desiccator at 37° to 40° or by exposure to the air for a week, and incorporated with pulverized anhydrous soil (10 gm. for each mycelial disk of 22 mm. in diameter, containing an average of 17,420 spores). Under such conditions the spores remain viable for over a year.

WILSON (I. M.). **Wilt disease of Flax in Great Britain.**—*Nature, Lond.*, cliv, 3918, p. 709, 1944.

During the last three seasons a serious disease has occurred in experimental plots at Aberystwyth in which oil varieties of flax (*Linum usitatissimum*) are grown, *Fusarium lini*, being repeatedly isolated from the stems, roots, and seeds. This is a new record for Great Britain. *F. culmorum* was found in association with *F. lini* on the seed.

GOULD (C. J.). **Tulip blight controlled by organic sulphurs.**—*Phytopathology*, xxxiv, 7, pp. 703–704, 1944.

Of the several fungicides tested in 1942 and 1943 at the Washington Agricultural Experiment Station for the control of tulip blight (*Botrytis tulipae*) on the Rev. H. Ewbank, William Pitt, and Rose Copeland varieties, fermate and thiosan, the latter also tested in Holland in 1938 under the name of 'tulisan' with promising results [*R.A.M.*, xix, p. 195], were the most effective. Of these two closely related preparations, both of which are derivatives of dithiocarbamic acid, fermate gives slightly superior control of the pathogen and was accordingly recommended for trials on a commercial scale, applications to be made at a dosage of 2 lb. in 100 gals. water at ten-day intervals, beginning when the leaves attain a height of 3 to 4 in. It is apt, however, to induce a splotchy appearance of the plants when applied by means of a knapsack sprayer, and the less conspicuous thiosan is therefore preferable for use in home gardens.

DOSDALL (LOUISE). **Rhizome treatments for controlling Botrytis crown rot in Iris.**—*Phytopathology*, xxxiv, 9, pp. 772–789, 5 diags., 1944.

Iris crown rot (*Sclerotinia convoluta*) [*R.A.M.*, xvi, p. 750] has been under observation in Minnesota since 1934, and in this paper a comprehensive, tabulated account is presented of experiments on the control of the disease, involving the application of a number of fungicides to 5,330 rhizomes of 14 varieties.

The external symptoms of the rot are so inconspicuous as to be generally overlooked by growers, who attribute to winter injury the loss of plants actually caused by the potentially destructive fungus, which may be borne on apparently

sound rhizomes from infested plantings, as well as on those harbouring conidia and sclerotia or developing the characteristic decay in the spring. In one year's test (1934–5) the incidence of crown rot was much less severe among plants covered with a straw mulch than in those left uncovered (2 as compared with 9 per cent.). Treatment of the rhizomes at transplanting time with mercury compounds, e.g., calomel [mercurous chloride] 1 in 128, semesan 1 in 400 or 1 in 200, yellow mercury oxide 1 in 128, mercuric chloride 1 in 1,000, or the same plus 1 per cent. hydrochloric acid, effectively combated the disease in clean, but not in heavily infested soil; under the latter conditions, however, some promise was shown by a mercurous chloride suspension stabilized with gum arabic. Some of the formalin treatments were equally effective with acid mercury in clean soil, but further trials are required to determine a satisfactory relation between the concentration of the solution and the immersion period. Another point needing elucidation is the variable response of different varieties to the same treatment.

BRIERLEY (P.) & SMITH (F. F.). **Studies on Lily virus diseases : the mottle group.**—*Phytopathology*, xxxiv, 8, pp. 718–746, 11 figs., 1944.

Continuing their studies on lily viruses [*R.A.M.*, xxiv, p. 18], the writers describe their comparative studies on three types of mottling, namely, a latent form from *Lilium tigrinum* (LT), the strong or coarse mottle of *L. longiflorum* (CM), and a more virulent derivative of the latter (VCM), in relation to McWhorter's tulip viruses, TV I and TV II [ibid., xvii, p. 603], in the test species *L. longiflorum*, *L. formosanum*, *L. tigrinum*, and Clara Butt tulip.

The host range of CM was found to be limited to Liliaceae, including *Calochortus* sp., *Fritillaria pudica*, tulip, and *Zygadenus fremontii*, besides the above-mentioned *L.* spp., *L. dauricum*, *L. davidi* var. *willmottiae*, *L. elegans*, *L. formosanum*, *L. leucanthum*, *L. superbum*, and *L. umbellatum*, and that of the other four viruses was similar, except that VCM also attacks *Ornithogalum thyrsoides*.

The properties of the five viruses were determined in *L. formosanum*. The thermal inactivation points of VCM, CM, and TV I were found to lie between 60° and 65°, and those of TV II and LT between 55° and 60° C. VCM and TV I retained their activity after dilution to 10^{-4}, CM at $10^{-3.5}$, TV II at 10^{-3}, and LT at 10^{-1}. All five survived four days' ageing at 18°, while CM was still virulent after five, and VCM and TV I after six days. VCM withstood six hours' drying on cloth, CM and TV I four hours, and TV II and LT less than two.

CM is transmitted by *Aphis gossypii*, *Macrosiphum solanifolii*, and *Myzus persicae*, the last-named likewise acting as an efficient vector of the other four viruses under observation. Besides *M. persicae* and *Macrosiphum solanifolii*, *Aphis fabae* and *A. gossypii* were shown for the first time to serve as vectors of the tulip-breaking virus (a mixture of TV I and TV II) from Rembrandt tulips to *L. formosanum*. CM, naturally or experimentally established in *L. longiflorum*, conferred absolute protection against the further addition of the same virus or VCM, an effect which was not exerted by TV I and TV II or LT from *L. tigrinum* in respect of VCM, while LT also failed to prevent the reinfection of *L. longiflorum* from CM in a destructive form.

Over 12,000 *L. longiflorum* seedlings raised from seed from diseased parents yielded no evidence of perpetuation of any of the lily viruses through this channel.

On the basis of these studies the authors propose to regard the five viruses under discussion as strains or subspecies of the tulip-breaking virus (*Marmor tulipae* Holmes amended) [ibid., xix, p. 229], which will correspond to *Tulipa* virus I (Cayley) Smith, omitting the supposed hosts *Hyacinthus* and *Narcissus*. VCM is considered to be a mutant from CM appearing in *L. longiflorum* stocks harbouring the latter virus. Easter lily-growers already ignore the presence of CM in *L. longiflorum*, the roguing of which for production of virus-free stocks has been

found impracticable, and a similar course is recommended in respect of VCM. although infection by the latter results in a certain (so far not unduly high) proportion of culls.

WHETZEL (H. H.). **The scab disease of Violets.**—*Plant Dis. Reptr*, xxviii, 23, pp. 769–770, 1944. [Mimeographed.]

During the summer of 1942 *Viola jooi* plants in the author's garden at Ithaca, New York, developed infection by *Sphaceloma violae* [*R.A.M.*, xxii, p. 250]. During the preceding ten years the plants had shown no trace of the disease and how the fungus gained admission to the garden remains unexplained. The disease spread rapidly to hundreds of *V. jooi* plants during the summer of 1943, many being killed and almost all the others badly deformed. Very little seed set and matured, the pedicels and seed capsules, as well as the young leaf petioles, being severely infected. In 1944 several species of wild violets and some pansies were also attacked, heavy infection being present on *V. striata*, *V. palmata*, *V. vilmoriniana*, *V. canadensis*, *V. sororia*, *V. odorata* (blue-flowered), *V. tricolor* (wild form), *V. tricolor* var. *hortensis*, and a large-flowered white violet, possibly *V. papilionacea* var. *alba*.

The disease presents a grave threat to garden-grown species of violets. It has not yet, apparently, attacked northern violets growing in the wild, but in the District of Columbia it has been reported on wild violets in gardens.

LINDER (D. H.). **A new rust of Orchids.**—*Mycologia*, xxxvi, 5, pp. 464–468, 8 figs., 1944.

A Latin diagnosis (with English description) is given of *Sphenospora kevorkianii* n.sp., causing considerable damage on *Epidendrum difforme* in Nicaragua, 1943.

TOMPKINS (C. M.). **Basal rot of Mums in California plantings.**—Reprinted from *Flor. Rev.*, 11th May, 1 p., 1944.

A basal rot of soft green cuttings of the pompom and large-flowering varieties of *Chrysanthemum hortorum*, occurring annually in a destructive form in cloth-house cutting benches in San Mateo County, California, from January to April, was shown by the weekly investigation of diseased material in February and March, 1944, to be associated with three fungi, viz., *Fusarium* sp., *Pythium* sp., and *Sclerotinia sclerotiorum*. Experiments to determine the relation of these organisms, if any, to the etiology of the rot are in progress. During the period covered by the observations, the weather was exceptionally dry and the incidence of infection consequently subnormal, but the outcome of tests of various fungicides for the control of the disease was highly promising in respect of fermate, with or without an admixture of celite 505 (a diatomaceous earth) in equal proportions.

ALLISON (J. L.) & TORRIE (J. H.). **Effect of several seed protectants on germination and stands of various forage legumes.**—*Phytopathology*, xxxiv, 9, pp. 799–804, 1944.

This is a report on the results of greenhouse and field trials at the Wisconsin Agricultural Experiment Station in 1942–3 to determine the influence of seed treatment with 5 per cent. new improved ceresan, spergon, and 50 per cent. arasan on the germination and stands of lucerne, white-flowered sweet clover (*Melilotus alba*), and medium red, alsike, strawberry, and Ladino clovers (*Trifolium pratense*, *T. hybridum*, *T. fragiferum*, and *T. repens*, respectively) [*R.A.M.*, xx, p. 211; xxii, p. 485]. Although large quantities of each fungicide adhered to the seeds (roughly 1 per cent. by weight), no reduction of germination occurred, though spergon retarded the process in *T. fragiferum* and *T. repens*. In the greenhouse tests the protectants gave a measure of control against pre-emergence damping-off

in compost soil infested with *Pythium*, *Rhizoctonia*, and *Fusarium* spp., significant increases in total emergence being registered for all treatments in the case of lucerne and *T. hybridum*, for new improved ceresan with *M. alba*, and for the same preparation and arasan with red clover. Spergon not only delayed emergence of *T. fragiferum* and *T. repens* but total emergence was very significantly reduced, indicating that the protectant so inhibited germination that the damping-off organisms were able to cause pre-emergent damping-off and rotting of the seedlings. In fungus-free woods-humus, only *M. alba* and *T. repens* responded favourably to any of the treatments, which presumably acted as stimulants to germination under such conditions. Field stands were not significantly improved by any of the fungicides, the general use of which cannot be advocated for Wisconsin on the basis of these investigations.

JONES (F. R.). **Life history of Cercospora on Sweetclover.**—*Mycologia*, xxxvi, 5, pp. 518–525, 1944.

Evidence is presented linking together a *Mycosphaerella* found in 1937 on overwintered stems of sweet clover (*Melilotus alba* and *M. officinalis*), the *Cercospora* commonly causing leaf spot and stem-blackening of sweet clover, referred to *C. davisii*, and a spermogonial stage on the same host.

Spots caused by *C. davisii* chiefly occur on older leaves of sweet clover. On stems the fungus produces discolorations. On stems of the first year's growth reddish-brown lesions develop, while on second-year growth the fungus usually becomes conspicuous when the plants are about to blossom. Pedicels become infected, maturing seed may fall prematurely, and the seed may be penetrated. The fungus varies greatly in intensity from year to year and is often in association with *M. lethalis*, which causes a somewhat similar discoloration of stems. Following the work of Horsfall [*R.A.M.*, ix, p. 319] *C. zebrina* has been generally adopted for the *Cercospora* on species of *Trifolium*, *Medicago*, and *Melilotus*, but Nagel (in an unpublished thesis of Iowa State College) made inoculations with the *Cercospora* from *Melilotus* on 16 species in *Medicago* and *Trifolium* and on *Melilotus alba* and only infected the last-named. This evidence and that in the present paper provide good reason for retaining the name *C. davisii* for this fungus.

In autumn small pycnidia with minute spores, apparently spermatia, often develop on blackened stems that have borne the conidial stage. None of these were observed on leaves. At first, they overflow with spermatia, but in late autumn they may be empty. The spermatia have not been germinated. This stage was cultured only by transferring the structure to an agar substratum; when this was done in late autumn, the structures sent out mycelium of *Cercospora* alone in most of the transplants. On pieces of infected stems incubated at temperatures of 8° to 16° C. spermogonia were produced, their development apparently being conditioned by temperature. That these spermogonia developed on inoculated plants apparently free from other fungi under the same conditions that favoured their development in the field strongly suggests that they belong to the life-cycle of the fungus. The spermogonia did not, however, develop in pure culture even on *Melilotus* stems.

In inoculation tests infection was always most successful in the older leaves and on the stems of second-year growth of sweet clover after blossoming had started. No visibly successful infection of first-year stems was made in the greenhouse. Isolations in the field showed that such stems are infected, though perhaps rarely or never with the fruiting stage. Inoculations were made with cultures of *Cercospora* from sweet clover, lucerne, and red clover upon all three, but infection resulted only upon the host from which the culture was obtained. At present it is convenient to regard the *Cercospora* on lucerne and that on red clover as distinct species.

Extreme and uniform resistance to stem-blackening by *C. davisii* was observed during two summers in selfed lines of *M. alba* derived from three resistant plants selected by Dr. W. K. Smith in a planting from seed collected by Westover and Wellman in Turkey in 1936, and designated by the Foreign Plant Introduction number 120,048.

The fungus, which is named *Mycosphaerella davisii* n.sp., is described as having dark, spherical perithecia 70 to 100 μ in diameter, cylindrical to club-shaped eight-spored asci without paraphyses, measuring 40 to 60 by 10 μ, and irregularly biseriate ascospores measuring 12 to 20 by 4 to 5 μ. The spermogonia develop in late summer and autumn on mature and dying stems only, especially at the margins of lesions; they are black, subepidermal, erumpent, often flattened and approaching an acervulus in form, with ostiole variable in size, and measure 80 to 120 μ in diameter. The rod-shaped spermatia measure about 1·5 to 3 by 1 μ. Solheim's amended description of *C. davisii* [ibid., x, 59] is reproduced.

HARRIS (M. R.) & SCHLOCKER (A.). **A survey of the Alfalfa dwarf disease in California.**—*Bull. Dep. Agric. Calif.*, xxxii, 2, pp. 163–167, 1 map, 1943.

Following the detection of lucerne dwarf in the southern San Joaquin Valley of California [*R.A.M.*, xxi, p. 278], a survey was made in 1942 to determine the extent and severity of the disease in the State, which for this purpose was divided into four areas, San Francisco Bay, North and South Central Valleys, and Southern California. The two former regions were altogether free from dwarf, which was present, on the other hand, in six counties each of the two latter. The most remarkable feature of the survey was the uniform spread of the disease northwards as far as Merced County (South Central Valley), where all traces of infection abruptly ceased, while the absence of dwarf from the parts of the Mojave Desert under lucerne is also of interest. In this connexion the two outstanding problems awaiting solution are (*a*) the identity of the insect vectors and their natural ranges, and (*b*) the discovery of alternate hosts.

In localities where dwarf was rife, it was estimated that the duration of life of the average lucerne stand was curtailed from upwards of ten to four years, or three in cases of extreme severity. In dwarf-free areas the stands may reach the age of 20 or even 40 years in a vigorous and productive condition.

Of the other lucerne diseases encountered in the course of the inspections, bacterial wilt (*Phytomonas insidiosa*) [*Corynebacterium insidiosum*] was the most destructive; mildew (*Peronospora trifoliorum*) was a prevalent early-season trouble that disappeared with the onset of hot, dry weather; leaf spot (*Pseudopeziza medicaginis*) was widespread but unimportant; and crown wart (*Urophlyctis alfalfae*) was observed only once or twice, causing negligible damage.

HIRSCHHORN (ELISA). **Nota sinonímica : Tolyposporium senegalense es sinónimo de T. bullatum.** [Note on synonymy: *Tolyposporium senegalense* is a synonym of *T. bullatum*.]—*Rev. argent. Agron.*, viii, 4, pp. 384–386, 1 pl., 1 fig., 1941. [Received December, 1944.]

The characteristic features of a specimen of *Tolyposporium senegalense* [*R.A.M.*, xx, p. 180] collected by Spegazzini at Dakar on *Pennisetum typhoideum* [*P. typhoides*] in 1913 and described in *An. Mus. La Plata*, xxvi, p. 118, 1915, include oval, black, compact sori, 4 to 6 by 3 to 4 mm., composed of globose, elliptical, or irregular, blackish or chestnut-coloured glomerules, 70 to 180 by 70 to 100 μ, and gilt or olive-yellow, oval or polygonal, rarely globose chlamydospores, 6 to 8 or 9 by 6 to 7 μ, enveloped in a smooth or slightly papillate membrane with projecting folds simulating slender mycelial processes. These characters are in almost complete agreement with those of *T. bullatum* Schroeter (Crypt. Fl. Schles., p. 276, cited by Saccardo, Syll. Fung., vii, p. 502, 1888), found on *Echinochloa crus-galli*

in Germany, and the Senegalese material is accordingly referred to the latter species on grounds of priority. In both cases the inflorescences were attacked and the ovaries destroyed, some of the flowers on each head remaining healthy.

FAGAN (F. N.), FREAR (D. E. H.), & MILLER (H. J.). **Speed sprayer is big labor saver ; works best on medium high trees.**—*Rep. Pa agric. Exp. Sta., 1942–43* (*Bull.* 446), *Suppl.* 3, pp. 2–3, 3 figs., 1944.

Tests on fruit trees in Pennsylvania in 1943 using a speed sprayer [*R.A.M.*, xxiii, p. 444] and an ordinary high-pressure outfit indicated that the former definitely reduces the time required for spraying. A heavy crop only very moderately affected by disease was obtained from the trees sprayed with the new machine, labour costs were halved, and the sprays were applied more speedily than has ever been possible with a high-pressure machine. Coverage, however, as estimated by residue tests, was not as good in the tops as it was in the bottoms of the trees. As far as is known at present the speed sprayer does very praiseworthy work on fairly open trees which are not too high. The trees sprayed in the test were apples, 24 and 30 ft. high. Those with relatively open tops lent themselves best to the new method.

The speed sprayer used consisted of a 500 gal. agitator tank from which the spray mixture is forced by means of a rotary pump developing 40 to 50 lb. pressure. The spray emerges from 86 nozzles at the rear, a propellor-like fan blowing the spray up and through the trees. A 76 h.p. motor drives the propellor at 2,400 r.p.m. A 500 gal. tank load was applied in 20 minutes, at the rate of about 1 tree per minute. Under these conditions, two men working on trees requiring 12 to 20 or more gals. per tree could do 2 to 2½ times as much work as two men with the high-pressure rig. An average of 2·3 more gals. of spray per tree was required than with the high-pressure outfit.

At harvest 300 fruits from the top and bottom, respectively, of the McIntosh trees were examined for scab [*Venturia inaequalis*]. The top fruit speed-sprayed and high pressure-sprayed had 16·1 and 7·8 per cent. infection, respectively, and the bottom fruit 1·5 and 0·9 per cent., respectively.

POWELL (H. R.) & CASS SMITH (W. P.). **The eradication of black spot or Apple scab in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxi, 11, pp. 148–155, 5 figs., 1944.

Apple scab [*Venturia inaequalis*] is stated to be present in every apple-growing country in the world except that no outbreak has occurred in Western Australia, since the season 1939–40 [*R.A.M.*, xix, p. 546], when the attacks were more serious than ever before.

The chief eradication measures adopted were as follows. A. When the outbreak was discovered, all visibly infected fruits and leaves were removed and destroyed, and all trees in the infected area as well as the ground under them were immediately sprayed with home-made Bordeaux mixture (6–6–40) plus spreader, a buffer area round the diseased trees also being sprayed with the same at 3–5–50 strength, plus spreader. B. After picking, the trees and ground were again sprayed with Bordeaux mixture (6–6–50) plus spreader, and no apples were sent away without official permission, and then only to approved destinations. Early in April a quick-growing cover crop was sown at a shallow depth to prevent infected leaves from blowing about, and in August or early September, but at least a fortnight before spur burst, the cover crop was deeply ploughed under in one direction, subsequent cultivation being delayed until approved, and limited to very light harrowing. In spring all the trees were sprayed as follows: (*a*) at spur-time, when the tips of the young leaves were showing, with Bordeaux mixture (5–4–50) plus spreader, (*b*) at the pinking stage of blossoming when most of the blossoms were

showing pink, but before the petals had opened out, with Bordeaux mixture (3–4–50) plus spreader, and (*c*) at petal-fall, with Bordeaux mixture (2–5–50) plus spreader. The measures listed under B were enforced each year until every infected orchard had remained visibly free from the disease for two full growing seasons. Of 23 orchards originally infected 20 have remained visibly free from infection for four full seasons, and the remainder for three.

HOCKEY (J. E.) & EIDT (C. C.). **Resistance of Apple seedlings to scab.**—*Sci. Agric.*, xxiv, 11, pp. 542–550, 1944.

In this paper the authors present the results of observations made during at least four years on the resistance to foliage scab (*Venturia inaequalis*) shown in Nova Scotia by some 30,000 apple seedlings of known varietal parentage allowed to develop for five or six years without fungicidal protection. Observations were made each year in July and August, the system used in recording the disease being as follows. Numbers were applied, 1 indicating no scab, 2 scab spots distinctly separate, 3 and 4 (not used), 5 scab very diffuse, 6 scab spots killed out, brown spots or flecks. Following each number or combination of numbers was a letter, A signifying less than 10 per cent. of the foliage affected, B 10 to 50 per cent. affected, C over 50 per cent. affected. A numerical system also recorded the disease on the fruit, the figures ranging from 0 (no scab) to 5, large active spots, coalescing, fruit cracking. By giving each rating a numerical value it was possible to obtain an average rating for the period of the work and to reduce the seedlings into the four groups, susceptible, slightly susceptible, slightly resistant, and resistant.

The evidence obtained indicated that resistance was recessive to susceptibility. The apparent resistance of triploid varieties would seem to be due to delayed foliation, leading to avoidance of infection. In the early stages of growth low apparent vigour in susceptible seedlings was due to severe infection. The variety Red Winter Reinette was the most resistant parent used, while the Cox Orange and Golden Russet gave good proportions of resistant progeny. With the exception of Delicious × Yellow Transparent, all crosses with Yellow Transparent as a male parent gave over 37 per cent. seedlings with resistance. The nearest approach to immunity observed locally was in seedlings of *Pyrus niedzwetzkyana*.

FITZPATRICK (R. E.), MELLOR (F. C.), & WELSH (M. F.). **Crown rot of Apple trees in British Columbia—rootstock and scion resistance trials.**—*Sci. Agric.*, xxiv, 11, pp. 533–541, 1944.

Details are given of tests carried out to ascertain the resistance shown by 40 different apple varieties and seedlings to *Phytophthora cactorum* [*R.A.M.*, xxii, p. 30] in British Columbia, and to determine whether depth of planting affected incidence. Inoculations on 1,560 trees showed that 11 varieties were quite susceptible and 11 partially so, while Antonovka, Columbia, Dolgo, Haas, Malling II, Robin, and Transcendent were resistant. There was no significant difference in the amount of rot that developed when the trees were planted with the union 4 in. above, at, or 4 in. below the ground-line.

SINGH (U. B.). **The pink disease of Apple in Kumaun.**—*Indian J. agric. Sci.*, xiii, 5, pp. 528–530, 1943.

Corticium salmonicolor has been observed in Chaubattia, India, indiscriminately attacking the apple, pear, and apricot. Inoculation experiments established the pathogenicity of the fungus, which produces its maximum effect from August to mid-September, the principal sources of infection being the spores of the *Necator* [*decretus*: *R.A.M.*, vi, p. 125] stage, and less frequently, the dry incrustations of the sterile nodular phase carried by wind and rain water. Control may be effected by painting the forks of the branches before the onset of the monsoon with a red

lead and copper carbonate paste in raw linseed oil (4:4:5); painting the pruned surfaces with the same compounds in lanoline (4:4:5); the excision of diseased material at least 2 ft. below the last site of invasion and burning or burying it after immersion in 50 per cent. copper sulphate; and the destruction (in apple orchards) of the alternate fruit hosts.

THOMAS (H. EARL), SCOTT (C. E.), WILSON (E. E.), & FREITAG (J. H.). **Dissemination of a Peach mosaic.**—*Phytopathology*, xxxiv, 7, pp. 658–661, 1 fig., 1 diag., 1944.

The disease originally known as 'Winters peach mosaic' [*R.A.M.*, xix, p. 417] and herein designated 'yellow bud mosaic' (*Inops consilii*) has been detected in 11 more orchards in the Winters district of Solano and Yolo Counties, California. The change to a more descriptive name is based on an early-season symptom sequence in which many buds on the severely affected branches, after initial growth to the length of a few mm., remain pale yellow and in a state of suspended development for a period of several weeks; at the end of this time they may either die or slowly put forth a tuft of small distorted leaves. The diseased trees occurred in compact groups, indicating that the virus agent tends to be transmitted from one tree to the next rather than over larger distances, which would result in the much more prevalent scattered type of distribution. Evidence is adduced to show that the vector of Winters peach mosaic (the identity of which has not yet been discovered), besides being very restricted as to movement, is strongly attracted to peach and apricot, finds almond less congenial, and is averse from the border rows of peach blocks.

SMITH (C. O.). **A method of inoculating Peach seedlings with crown gall without using punctures.**—*Phytopathology*, xxxiv, 8, pp. 764–765, 1944.

To verify the opinion of Smith and Cochran [*R.A.M.*, xxiii, p. 378] that the irrigation water used in California nurseries with no previous history of crown gall [*Bacterium tumefaciens*], where the disease is nevertheless prevalent, serves as a source of contamination, peach pits were planted in a dark-coloured mountain potting soil (P_H 8·36) previously sterilized with chloropicrin gas. A week later, as emergence was proceeding, the soil in some of the 5-gal. containers was watered with a suspension obtained by the immersion overnight of 20 fair-sized crown galls in 20 qts. water at the rate of 1 qt. per can. Following one season's growth, 175 of the 329 trees (53 per cent.) treated in this way bore galls, compared with nine of the 93 controls (9·6 per cent.). The occurrence of galls on the latter may have resulted from (*a*) spattering by the infected soil of inoculated cans, (*b*) incomplete sterilization of the planting soil, or (*c*) the pits stratified in sand or peat. The trees comprising the controls were irrigated with water from the deep wells of the Riverside city system. *Bact. tumefaciens* can enter its host only through injuries [ibid., xix, p. 549], such as those commonly inflicted by insects. These were apparently absent from the sterilized soil, but may have been introduced with the rinsing water from the unsterilized galls.

BLODGETT (E. C.). **Peach calico.**—*Phytopathology*, xxxiv, 7, pp. 650–657, 1 fig., 1944.

Foliar variegation on five peach trees in Idaho was shown by bud-inoculation experiments to fall into at least two types. One of these is non-transmissible and is regarded as a chimera. It is characterized by the irregular yellowing of sharply delimited areas of three distinct shades of green. The transmissible type, known as 'calico' and attributed to a virus, takes the form of extensive chlorosis, culminating in a papery-white discoloration of the leaf and twig tissues. Affected fruits are shorter and rounder than the normal and show creamy-white to red patches.

LI (L. Y.) & PROCTER (C. H.). **A virus disease of Fig in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xxvi, 2, pp. 88–90, 5 figs., 1944.

A virus disease of fig, the symptoms of which, both on foliage and fruit, agree closely with those of *Ficus* virus 1 Smith, 1937 [*R.A.M.*, xvii, p. 52] and of Condit and Horne's Californian fig mosaic [ibid., xxiii, p. 33], was first observed in New Zealand in 1942 at Wellington, and is now known to be present in home gardens throughout North Island. It is transmissible by grafting and budding.

COMAR (C. L.) & BARR (C. G.). **Evaluation of foliage injury and water loss in connexion with use of wax and oil emulsions.**—*Plant Physiol.*, xix, 1, pp. 90–104, 3 figs., 1 diag., 1944.

After pointing out that the evaluation of the effects of spray materials on plants may be confused by the lack of reliable methods for the measurements of injury caused by the treatment, the writers fully describe a method for the evaluation of the damage inflicted on plant foliage by wax and oil emulsions employed for the prevention of desiccation. The symptoms of such injury may take the form either of discoloration of the margin and tips, sometimes extending over the whole leaf blade, or of physical changes, such as withering or loss of turgidity. The experimental procedure involved the use of an environment chamber, in which light and temperature were controlled. Infra-red photography proved to be a useful adjunct in the measurement and illustration of those types of foliar damage entailing chlorophyll destruction. Sunflower was used as the test plant, and the uppermost four well-developed leaves served as an index of the entire plant for the photographs and injury ratings. Each leaf was assigned a rating of 25 for complete injury and the total for the four leaves represented the percentage rating for the whole plant. In the tests described the toxic effects of the commercial wax emulsion applied were shown to be due only to one of its components, ammonium lineolate, at concentrations of 1·5 per cent. and upwards.

LEACH (L. D.) & HOUSTON (B. R.). **Seed treatment for field and vegetable crops.**—6 pp., 2 figs., University of California Agricultural Experiment Station, 1944. [Mimeoprinted.]

Brief, practical notes are given on the seed treatment of cereal and other field crops and vegetables against diseases commonly found in California.

HAWKER (L[ILIAN] E.). **Fungi and vitamins.**—*Roy. Coll. Sci. J.*, xiv, pp. 65–78, 1944.

In this lecture (delivered on 9th March, 1944) the author discusses with numerous references to the relevant literature the relations between fungi and vitamins in respect mainly of the effect of vitamins on fungal growth. The points dealt with comprise bios, vitamin B_1, biotin, inositol, miscellaneous growth substances, and the effect of growth substances on the reproduction of fungi. A bibliography of 79 titles is appended.

BATEN (W. D.). **The discriminant function applied to spore measurements.**—*Pap. Mich. Acad. Sci.*, xxix (*1943*), Part I, pp. 3–7, 1 graph, 1944.

Three methods are presented for testing significance between means pertaining to length and width measurements of spores from two species of fungi, *Galera crispa* and *G. lactea*, the data relating to which were furnished by E. A. Bessey (*Pap. Mich. Acad. Sci.*, xxix (*1943*), Part I, pp. 9–16, 1 graph, 1944). The fungi grow side by side on the campus of Michigan State College, and the comparisons involved the measurement of 140 spores from four specimens of the former and 160 from the same number of the latter species. An analysis of variance on the measurements

of each species revealed no evidence of heterogeneity. The application of 99 percentage ellipses, however, showed that the two species differ in averages pertaining to spore measurements, while the use of R. A. Fisher's discriminant function (*Ann. Eugen.*, vii, pp. 179–188, 1936) revealed that width measurements are more important than length measurements for determining significance between them. References to the literature on the mathematics of the two last-named methods are cited.

PARRIS (G. K.). **A simple nuclear stain and staining technique for Helminthosporia.** —*Phytopathology*, xxxiv, 7, pp. 700–702, 1944.

The writer has obtained very satisfactory results in the staining of *Helminthosporium* spp. by the use of Maneval's acid fuchsin reagent, consisting of 30 c.c. 5 per cent. aqueous phenol, 8 to 10 c.c. 20 per cent. aqueous glacial acetic acid, 4 c.c. 30 per cent. aqueous ferric chloride, and 1 to 2 c.c. 1 per cent. aqueous solution of acid fuchsin (*Stain Tech.*, xvi, pp. 13–19, 1941).

ROBERTS (M.), LAUFER (S.), STEWART (E. D.), & SALETAN (L.). **Saccharification of Wheat by fungal amylases for alcohol production.**—*Industr. Engng Chem.*, xxxvi, 9, pp. 811–812, 1944.

Bran mashes prepared from maize, winter and spring wheat, and the granular flour of the two latter, and saccharified through the agency of the mould *Aspergillus oryzae*, yielded from 2 to 14 per cent. more alcohol than those treated with malt. Favourable conditions were provided by the use of 3 to 4 per cent. dry mould bran on a mash cooked at atmospheric pressure and saccharified at 30° C., at which temperature the yield was equal to or slightly higher than those obtained at 52·5°. The simplified procedure and high yields resulting from the substitution of 3 to 4 per cent. dry mould bran for 8 per cent. malt should be of interest to those engaged in alcohol production from wheat or granular wheat flour. The superiority of the mould method was particularly striking in the tests with flour, in which the increases amounted to 5 and 10 per cent., respectively, for winter and spring wheats over the maximum secured with 8 per cent. malt.

VANGHELOVICI (M.) & SERBAN (FELICIA). **The influence of organic media on the composition of Aspergillus niger.**—*Bull. Sect. sci. Acad. roum.*, xxv, pp. 157–164, 1942. [Abs. in *Chem. Abstr.*, xxxviii, 19, p. 5252, 1944.]

When *Aspergillus niger* is grown on a mineral substratum in which glycerol replaces glucose as the sole source of carbon, marked changes occur in the composition of the mould in respect of total lipoids, nitrogen, pigments, and ash. Such modifications, however, are purely temporary, since on re-transference to a glucose medium the glycerol cultures reassume their original properties as regards colour, friability, and composition. This variation is interpreted as the first step in the direction of a true mutation [cf. *R.A.M.*, xxi, p. 468], such as is effected by certain toxic substances, e.g., colchicin, camphor, and acenaphthene, or by X-rays, and is likewise associated with well-marked alterations in the composition of the fungus. Thus the presence of harmless substances in the soil may play an important part in the development of a new species.

JAHIEL (R.), GUBERMAN (ETHEL), & KAZDAN (R.). **Action of radioactive substances on the speed of growth of Penicillium notatum and the production of a potent penicillin.**—*Science*, N.S., c, 2596, p. 298, 1944.

Irradiating cultures of *Penicillium notatum* by means of radium in porcelain tubes, the authors found that in the presence of the radon thus produced the peak

of secretion of potent penicillin was reached two or three days earlier than in the non-irradiated control cultures, this result being attributed mainly to the Alpha radiation. When fluorescein was added to the medium, the effect of the radioactive elements was noticeably improved.

BRIAN (P. W.). **Production of gliotoxin by Trichoderma viride.**—*Nature, Lond.*, cliv, 3917, pp. 667–668, 1944.

In 1942 the author received from H. Raistrick a culture supplied to the latter as Weindling's strain of *Gliocladium fimbriatum* [*R.A.M.*, xvii, p. 338], which produced gliotoxin. Later an isolate of *Trichoderma viride* (No. 211) was found to produce gliotoxin at nearly twice the rate. Another culture of *G. fimbriatum* (NCTC. No. 6599) was quite different from these two isolates (which were very similar in their microscopic cultural characters), and failed to yield gliotoxin. The original description of *G. fimbriatum* by Gilman and Abbott gave the conidial measurements as 6·5 to 9·5 by 2·5 to 4 μ, and the phialides as measuring 10 to 20 μ, and did not record the presence of chlamydospores. The corresponding measurements for *G. fimbriatum* NCTC. 6599 are 5·5 to 7·5 by 3 to 3·5 μ, and 14 to 20 μ, with no chlamydospores; for Weindling's 'strain' they are 4·4 to 5·2 by 3·5 to 4·5 μ, and 7 to 11 μ, with abundant chlamydospores; and for *T. viride* No. 211 they are 4·5 to 5·5 by 3·5 to 4·5 μ, 7 to 10 μ, with abundant chlamydospores.

From this and other evidence the author concludes that the fungus obtained as Weindling's strain of *G. fimbriatum* was actually a strain of *T. viride*. The well-known antagonistic powers of *T. viride* are probably due, in part at least, to the production of gliotoxin.

STEVENSON (F. J.). **Potato breeding, whither bound?**—*Amer. Potato J.*, xxi, 7, pp. 192–199, 1944.

The author outlines the past work and future plans of the national potato-breeding programme of the United States Department of Agriculture, which has been in operation for 14 years. In the last 11 years 17 new varieties have been tested and distributed to growers. Of these the most extensively grown late variety is Katahdin (released in 1932) which comprises 16·1 per cent. of all seed certified in 1943 in the United States and 34 per cent. of that certified in the same year in the Maritime Provinces of Canada. Katahdin surpasses its nearest competitor, Green Mountain, by nearly 50 per cent. The amount of certified seed of Chippewa (1933) grown in 1943 represents 4·18 per cent. of the total for all varieties, a decrease since the previous year. Sebago (1938), with 5·66 per cent. in 1943, shows the most spectacular increase. None of the varieties released combines all the desirable characters, summarized here under 21 headings and including field immunity from mild mosaic; immunity from latent mosaic [potato virus X] and potato wart [*Synchytrium endobioticum*]; resistance to veinbanding mosaic [potato virus Y], leaf roll, yellow dwarf, tuber rot initiated by the late blight fungus [*Phytophthora infestans*], common scab [*Actinomyces scabies*], and southern bacterial wilt or brown rot [*Xanthomonas solanacearum*]; a high degree of resistance to net necrosis in the tubers caused by current-season infection by the leaf roll virus; resistance to or immunity from late blight in the foliage; and resistance to or tolerance of *Fusarium*. It is not expected that the ideal variety combining all the desirable characters will be produced in the near future, but varieties have been produced that combine earliness and good cooking quality with a high degree of resistance to blight, and others that combine earliness and high market quality with scab resistance. The scab-resistant varieties are not wholly satisfactory in other respects, but, until better ones are produced, it may become necessary to use them for a restricted but important area of the States where scab renders the production of grade 1 potatoes almost impossible. No alarm need be felt at the great number of

new varieties released; this was inevitable at first, but it will become increasingly difficult to breed any superior to those already in production.

MARRITT (J. W.). **Treating, packaging, and storing Potato eye sets.**—*Sci. Agric.*, xxiv, 11, pp. 526–532, 1944.

After stating that eye sets are becoming an increasingly important factor in the seed potato trade of the Prairie Provinces of Canada, since they can be widely distributed for a small cost, the author describes experiments carried out to devise a satisfactory method of handling them to avoid deterioration. The recommendations made are as follows. (1) Carefully select the certified seed stock from which the eyes are to be taken, using only stock that has remained free during storage from frost injury and rots. The best time to make the selection is before grading. (2) Treat the tubers with an organic mercury dip before the eye sets are cut. (3) Use a tool that cuts an eye set at least $\frac{7}{8}$ in. deep and weighing $\frac{1}{2}$ oz. (4) Wash the eyes in clean water as soon as they are cut. (5) Pack the eye sets as soon as washed in a moisture-proof container, e.g., a waxed carton wrapped in waxed Kraft paper. (6) Store at 77° F. from four days to a week and then at 38° until shipped. The next-best storage is at 38° continuously.

ORLANDO (A.) & SILBERSCHMIDT (K.). **Estudos sôbre a transmissão do virus Y das Batatinhas por afídeos.** [Studies on the transmission of Potato virus Y by aphids.]—*Biológico*, x, 8, p. 269, 1944.

Although aphids are known in other countries to be the principal vectors of potato viruses, exact information as to their part in the transmission of this group of diseases in São Paulo, Brazil, was hitherto lacking. Two of the species abundantly colonizing potatoes were identified by C. Reiniger as *Myzus persicae* and *Macrosiphum solanifolii*, while a third, of less frequent occurrence, was tentatively referred to *Myzus circumflexus*. Of the three kinds of aphids *M. persicae* proved to be the most efficient vector of virus Y, which it conveyed in some of the tests to all the plants exposed to its visits, while (?) *M. circumflexus* and *Macrosiphum solanifolii* were about equally effective, each transmitting the disease to some 50 per cent. of the test material. Two crucifers (white mustard and radish) and a member of the Solanaceae (*Datura stramonium*) were frequently found serving as natural alternate hosts of the aphids, the extermination of which by direct and indirect means should henceforth be one of the foremost objects of the phytosanitary programme for potatoes.

GODFREY (G. H.). **Control of Potato late blight in Lower Rio Grande Valley with an organic fungicide plus zinc sulfate and lime.**—*Plant Dis. Reptr*, xxviii, 20, pp. 657–659, 1944. [Mimeographed.]

In a field test conducted in the Lower Rio Grande Valley, Texas, in 1944, the organic fungicide dithane (disodium ethylene bisdithiocarbamate, previously known as He-175), with and without added zinc salts and lime, was compared with certain standard copper fungicides in the control of potato late blight (*Phytophthora infestans*) [*R.A.M.*, xxiii, p. 497]. It was shown that all treatments were superior in yield to the untreated controls. The dithane spray, with added zinc sulphate and lime, at the rates of 2–1–$\frac{1}{2}$ or 1$\frac{1}{2}$–1–$\frac{1}{2}$ lb. per 100 gals. water, gave the best yields with 242 and 239 bushels per acre, respectively, superior to yellow cuprocide or dithane zinc oxide sprays or dusts and to tribasic copper sulphate dust. The two copper dusts were significantly more effective than any of the dithane dusts, but the latter did give distinct benefit. It is concluded from these results that in the event of a serious shortage of copper a satisfactory control of late blight can be achieved with an organic fungicide in spray form.

SANFORD (G. B.) & GRIMBLE (J. G.). **Observations on phloem necrosis of Potato tubers.**—*Canad. J. Res.*, Sect. C, xxii, 4, pp. 162–170, 1 pl., 1944.

Field tests carried out in Alberta during the period from 1935 to 1943 showed that in four out of the seven random lots of certified potatoes examined (varieties Netted Gem or Russet Burbank, Vick's Extra Early, and Carter's Early Favourite) the tuber phloem necrosis, which had developed before harvest, was due to infection by the leaf-roll virus [*R.A.M.*, xxiii, p. 272], as definite leaf-roll symptoms developed the following season. It appeared that, once definite leaf-roll symptoms develop, the phloem no longer exhibits leaf-roll net necrosis [loc. cit.]. In the other three lots (Columbia Russet and Netted Gem), however, a similar and often indistinguishable tuber phloem necrosis was evidently not due to the leaf-roll virus. This latter type of necrosis was transitory, but differed from the former in that affected seed pieces produced quite normal plants free from leaf-roll symptoms. In one of the three lots the necrosis had resulted from the tomato psyllid, *Paratrioza cockerelli*, feeding on the plants during midsummer, but the agent in the other two cases is as yet unknown. The tissue surrounding the necrotic phloem elements in the tubers affected by leaf-roll was found to be uniformly fluorescent, whereas the unaffected parts of the same tubers, as well as non-necrotic tubers from leaf-roll plants, reacted negatively to ultra-violet light.

TERVET (I. W.). **Purple-top wilt of Potato and the Aster-yellows virus in the Dakotas.**—*Plant Dis. Reptr*, xxviii, 25, pp. 816–817, 1944. [Mimeographed.]

During the few weeks preceding 15th August, 1944, all plantings of carrots in gardens and truck farms in the Black Hills region of South Dakota were found to be infected, apparently, with aster yellows virus. In about half the plants evidence of infection, based on the purple colour of older leaves and the tendency for excessive development of new, chlorotic leaves, was readily seen. Carrots in farm gardens in south-western North Dakota were similarly affected.

At Mandan, North Dakota, examinations of gardens by the author and R. Sprague showed that at least 50 per cent. of the carrot plants were infected; on lettuces, some flowering shoots were distorted and chlorotic, and were assumed to be affected. Salsify was also attacked, all the plants in one planting being infected. Affected weeds included *Erigeron canadense*, *Lactuca scariola*, and species of ragweed [*Ambrosia*].

Potatoes in the Black Hills and at Mandan, growing near infected weeds or carrots were in all cases free from the symptoms of purple top wilt [*R.A.M.*, xxiii, p. 273]. In the Dakotas the evidence for associating aster yellows and purple top wilt in potatoes does not appear to be good, because in areas where aster yellows is prevalent on carrots and other plants it is often difficult to find purple top wilt on potatoes. The Bliss Triumph potato, widely grown in the Black Hills and at Mandan, is quite susceptible to purple top wilt in the Red River Valley.

BARRUS (M. F.). **A Thecaphora smut on Potatoes.**—*Phytopathology*, xxxiv, 8, pp. 712–714, 2 figs., 1944.

A diagnosis [in English only] is given of *Thecaphora solani* n.sp., the agent of the 'buba' (small pustule or tumour) disease of Andean potato (*Solanum andigenum*) tubers already described from Venezuela [*R.A.M.*, xxiii, p. 118] and since ascertained to occur also in Peru and Ecuador. The pathogen is characterized by subcircular sori, up to 1 mm. long, embedded in the cortex and pith of warty, lobed, or otherwise misshapen tubers, surrounded while young by phellem and containing yellowish to rusty-brown, subspherical to ovoid spore balls, 12 to 48 by 12 to 35 μ, composed of two to eight adherent subspherical to ovoid spores (usually three to six, occasionally one), 7·5 to 20 by 8 to 17·5 μ, their contiguous walls smooth and the free wall rounded, thick, and verrucose.

ADDICOTT (F. T.). **Anatomical effects of oil spray injury in Guayule seedlings.**—*Phytopathology*, xxxiv, 7, pp. 697–699, 2 figs., 1944.

Oil sprays used in guayule [*Parthenium argentatum*] nurseries at Salinas, California, for the extermination of weeds have been found to produce a more or less extensive brownish discoloration of the foliage, often accompanied by withering of the cotyledons. An anatomical study of fixed and stained material revealed collapse of the palisade cells within 30 minutes of exposure to the herbicide, the injurious effects of which, involving quasi-total cytolysis, reached a climax in 24 hours. The most severe damage occurred in the epidermal tissues and those of the palisade just within the stomata, i.e., in the regions in direct contact with the oil.

ROBINSON (R. R.). **Inhibitory plant growth factors in partially sterilized soils.**—*J. Amer. Soc. Agron.*, xxxvi, 9, pp. 726–739, 3 figs., 1944.

A full account is given of the writer's studies at the Regional Pasture Research Laboratory, State College, Pennsylvania, on the deleterious effects of steam sterilization of the soil on plant growth [*R.A.M.*, xxiii, p. 357] and the possibilities of preventing or overcoming them. Symptoms of the trouble may be expressed as retardation of growth, purple pigmentation, and mottled or necrotic foliage. In some cases seed germination is inhibited but plant growth is normal, while in others the position is reversed. The soils used in the investigations (silt loams and their subsoils and a fine sandy loam) were all low in available phosphorus, but differed widely in other respects. Of the crops tested, Ladino and red clover were particularly sensitive to the injury, tomato, barley, and maize intermediate, and rye grass [*Lolium perenne* and *L. multiflorum*] and buckwheat unaffected.

The adverse effects of sterilization were entirely counteracted by heavy applications of phosphate either before or after the treatment. They appear to be due to a toxic concentration of some as yet unidentified substance. Incubation of the soil for a few days at 50° C. acted on plant growth similarly to two hours' steam sterilization at 5 lb. pressure, the critical temperature for a wet soil lying between 40° and 45° and for a dry one somewhat higher. In steam-sterilized soil plant growth was about the same whether it was wet or dry during sterilization. The inoculation of heat-treated with untreated soil exerted little immediate effect on plant growth, but materially curtailed the duration of the inhibitory action.

CHOWDHURY (S.). **An Alternaria disease of Safflower.**—*J. Indian bot. Soc.*, xxiii, 2, pp. 59–65, 1 pl., 1 fig., 1944.

Alternaria carthami n.sp. produces on safflower (*Carthamus tinctorius*) leaves spots composed of alternating light and dark brown, concentric rings, 1 cm. in diameter, frequently coalescing into large, irregular lesions and assuming a brittle texture which is apt to lead to the breaking of the leaf blade. The stems and petioles suffer less severe damage, but infected flower buds shrivel without opening following the extension of the dark brown spots from the base of the calyx to other parts of the inflorescence. The writer observed the disease at Pusa and other places and a report has also been received of its occurrence in the Central Provinces, but it does not appear to be known in other parts of India.

The pathogen is characterized by dark, pluriseptate hyphae; erect, simple, 0- to 5-septate, brown to olivaceous (hyaline-tipped) conidiophores, 15 to 85 by 6 to 10 μ, geniculate at the apex and sometimes laterally, and occasionally showing a spherical swelling at the base; and light brown conidia of variable shape, occurring in chains of at least two and consisting of 3 to 11 cells, with up to six longitudinal septa, measuring 36 to 99 by 12 to 28 μ (without the light brown to hyaline beak, which is usually present and ranges from 15 to 84 by 3 to 5 μ). On oatmeal agar

and other standard media the largely submerged mycelium imparted a dark green colour to the substratum. The optimum temperature for growth was found to lie between 25° and 30° C. A wide range of hydrogen-ion concentration was tolerated, with an optimum between P_H 6 and 7.

Positive results were obtained in inoculation experiments with spore suspensions or by the application to the plants of portions of cultures, the presence of moisture being essential for any appreciable degree of infection.

Cross-inoculation experiments with *A. carthami* on potato, tomato, cucumber, and cotton gave negative results, and the dimensions of the safflower fungus did not altogether correspond with those of *A. solani*, *A. tomato*, *A. cucumerina*, or *A. macrospora*, its nearest affinities. These facts appear to justify the erection of a new species for the agent of the safflower leaf spot.

PROCTER (C. H.). **A virus disease of Henbane (Hyoscyamus niger L.) in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xxvi, 2, pp. 83–87, 7 figs., 1944.

Early in 1943, 10 to 20 per cent. of the henbane (*Hyoscyamus niger*) plants first grown experimentally in the Hutt Valley, New Zealand, in 1942 were observed to be affected by a virus disease causing in the field severe stunting and foliar mottling and puckering, and inducing in the greenhouse symptoms of three general types, viz., vein-clearing, veinbanding, and foliar mottling. The disease was communicated by leaf-rubbing with expressed juice from *H. niger* and artificially infected Warne tobacco plants to *Nicotiana rustica*, *N. glutinosa*, King Edward potato, tomato, *Petunia hybrida*, and *Solanum nigrum*. On tobacco the henbane virus causes primary vein-clearing, secondary veinbanding, and chlorotic mottling. The reactions of *N. rustica* are initially less pronounced, but typical vein-flecking and chlorotic mottling develop in the later growth. *N. glutinosa* shows mild vein-clearing, followed by yellow mottling and leaf crinkle, and later by flecked veinbanding on the lower foliage and a dark green mosaic on the auxiliary shoot leaves, while dark green streaks are also formed on the stems of old infected plants. Dark green rings, 2 to 4 mm. in diameter, with paler centres appear on inoculated potato leaves, while the petioles and stems bear brown, necrotic streaks, 1 to 3 and 4 to 6 mm. in length, respectively. Leaf-drop begins within four days of infection, progressing from the base upwards and leaving only a tuft of young leaves at the apex. Tomato leaflets develop a bronze mottling 25 days after inoculation. *P. hybrida* reacts by vein-clearing and slight to severe puckering of the foliage. On *S. nigrum* the symptoms are masked, but tobacco plants inoculated with juice from the plants contract the typical symptoms of infection.

The virus retains its pathogenicity for a period between 48 and 72 hours. Its dilution end point lies between 1 in 10,000 and 1 in 100,000, and its thermal death point between 60° and 65° C.

Notwithstanding certain resemblances, the henbane virus differs from *Hyoscyamus* virus II [potato virus Y] and *H.* virus III [henbane mosaic virus: *R.A.M.*, xii, p. 243], and from *Solanum* virus 2 [potato virus Y]. Pending further studies on its relationships, however, the virus is not to be classified as a new one.

HIRSCHHORN (ELISA). **Una especie de 'Ustilago' nueva para la Argentina, 'Ustilago scitaminea'.** [A species of *Ustilago* new to Argentina, *Ustilago scitaminea*.]—*Rev. argent. Agron.*, viii, 4, pp. 326–330, 2 figs., 1941. [Received December, 1944.]

In this paper the author critically compares the Tucumán material of sugar-cane smut with *Ustilago consimilis*, *U. scitaminea*, *U. sacchari*, *U. microthelis*, *U. erianthi*, and *U. pulverulenta*, and concludes that the Argentine fungus approximates most nearly to *U. scitaminea*.

FAWCETT (G. L.). **El 'carbón' de la Caña de Azucar (Ustilago scitaminea Syd.).** [Sugar-Cane smut (*Ustilago scitaminea* Syd.).]—*Bol. Estac. exp. agríc. Tucumán* 47, 15 pp., 11 figs., 1944.

The available information regarding sugar-cane smut (*Ustilago scitaminea*) is summarized, with special reference to its occurrence in Tucumán, Argentina [*R.A.M.*, xxiii, p. 408]. Until recently Argentina was the only American country from which the disease had been notified with certainty, its alleged appearance in Brazil [ibid., xii, p. 723] not having been confirmed by the competent authorities, but the pathogen is now known to have spread to Paraguay. The immense numbers of chlamydospores produced within the flagelliform appendage [ibid., iv, p. 127], (15 cm. to over 1 m. in length, attached to the last internode of each infected bud), and their minute size (5 to 6 μ in diameter), account for the dissemination of these spores by the wind. In some cases the axis of the inflorescence has been found enclosed in the appendage with chlamydospores. Like other *U.* spp., the sugar-cane smut is essentially a parasite of the young meristematic tissues, entering its host exclusively through the lower part of the bud (below the scales). The mycelium has never been detected by the writer in the internodes or elsewhere, and he could not substantiate the observation of certain workers as to its passage from one bud to another by way of the internodes. His view is that each diseased bud represents a separate and independent infection emanating from one of three possible sources, namely, the soil, where the buds of the internodes below ground-level contract the disease and give rise to the smutted shoots appearing in the spring; the lateral buds producing the side branches of the cane during the summer; and the tips of the fully grown shoots. Of these, only the first is of practical importance in reducing the numbers of buds capable of forming canes fit for harvesting. When the number of smutted buds annually exceeds that of healthy ones, the stock produces fewer shoots and dies within a few years, as was the case with P.O.J. 36. Under favourable conditions the diseased buds begin to swell and grow until their development is checked by cold, dry winter weather, to be resumed in the spring, when infected shoots are produced. Non-infected buds germinate much later, so that the smut evidently accelerates shoot growth.

The chlamydospores on germination give rise to promycelia of variable dimensions, averaging 16 by 3 to 4 μ and composed of three cells, from each of which oval sporidia are produced, sometimes five or six at a time, measuring 6 by 2 μ and tapering towards the extremities. In some cases the sporidia germinate by means of long, septate hyphae, or put forth fresh sporidia from one of their extremities. Instances were also observed in which the promycelia produced, instead of sporidia, long, septate branches either from the uppermost of the three cells or the basal one. It is of interest to note that sporidia from eleven-month-old cultures grew vigorously on subculturing, indicating the probable ability of *U. scitaminea* to persist for lengthy periods on plant refuse in the soil.

A peculiar feature of transverse sections of the flagelliform appendage consisted of black 'tubes', which appeared to be composed of half-grown spores; in the case of older preparations, the latter were missing and the 'tube' walls appeared as opaque, solid membranes. Tangential sections revealed quadrangular membranes or plates, 2 to 5 by 1 to 2 mm., forming a sort of network over the surface of the sporiferous cylinder and actually representing the sides of microsori bounded below by the mycelium and above by clusters of mature spores awaiting dispersal by wind or rain. The 'tubes' are simply the spaces between the microsori viewed transversely.

Only a few of the buds inoculated with fresh spores gave rise to smutted shoots, and the slowness of the process was remarkable in a fungus of such strongly parasitic habit. This important aspect of the problem merits further study.

Generally speaking, the spores vary little either in size or colour. The mean diameter of 100 from an infected P.O.J. 36 shoot was 5·8 and the range from 5·6 to 6·9 μ. Considerable fluctuations were observed, however, among those adhering to the appendage after the fall of the majority. For instance, 100 exterior spores from a Tuc. 519 shoot measured 4·7 to 7·5 μ and those near the axis 4·1 to 9·4 (means 6·2 and 6·4 μ, respectively), while in the case of Tuc. 1376 the exterior and interior ranges were 5·6 to 7·5 and 5·4 to 8·4 μ, respectively, and the mean diameters 5·9 and 6·5 μ, respectively. These dimensions are somewhat smaller than those reported by Mundkur [ibid., xix, p. 237], but they are considered to be in sufficiently close agreement with his var. *sacchari-barberi* (also in their mummy-brown coloration) for the Argentine form to be identified with the latter. This opinion, however, is not fully shared by Dr. Elisa Hirschhorn (*Notas Mus. La Plata*, viii, pp. 23–38), who divides the Argentine material into six groups, of which one (No. 4) approximates to Mundkur's var. *sacchari-officinarum*.

On a modified Czapek's solution the Argentine collections of *U. scitaminea* grew equally well whether nitrogen was supplied in the form of inorganic salts or in that of peptone, but dextrose constituted a better source of carbon than levulose. The smut inverts saccharose but is unable to utilize cellulose, another point of interest in relation to its parasitic tendencies. Instead of cytase, the cellulose-decomposing enzyme, the fungus presumably forms some other substances capable of dissolving the cell walls through which its hyphae penetrate. Starch also proved to be unassimilable by the pathogen. The optimum hydrogen-ion concentration for the growth of *U. scitaminea* lies round about P_H 6·5, with lower and upper limits above P_H 2 and below P_H 9, respectively; the mean promycelial length at P_H 3, 4, 7·6, and 8·2 was 4, 10, 20, and 5 to 10 μ, respectively. The addition to the nutrient solutions of sodium chloride up to 5 per cent. failed to inhibit the growth of the smut, which was retarded, however, by 1 per cent. sodium carbonate.

KERN (F. D.) & THURSTON (H. W.). **Additions to the Uredinales of Venezuela. IV.** —*Mycologia*, xxxvi, 5, pp. 503–517, 1944.

With this instalment 30 species are added to the published lists of Venezuelan Uredinales [*R.A.M.*, xxiii, p. 316], bringing the total up to 292.

ROGERS (D. P.). **On the dates of publication of Schweinitz's Synopses.**—*Mycologia*, xxxvi, 5, pp. 526–531, 1944.

The author presents evidence showing that the date of publication of Schweinitz's 'Synopsis fungorum Carolinae Superioris secundum observationes Ludovici Davidis de Schweinitz' was 6th April, 1822, and that his 'Synopsis Fungorum in America Boreali media degentium' appeared about the middle of 1832.

KARLING (J. S.). **The simple holocarpic biflagellate Phycomycetes.**—x+123 pp., 25 pl., 3 diags., New York City, published by the author, 1942. $3.50.

The simple, holocarpic, biflagellate Phycomycetes, comprising a heterogeneous collection of some 80 species characterized by reduced holocarpic thalli and biflagellate zoospores, were formerly included by most mycologists in the family Woroninaceae of the Chytridiales, while the elongate, mycelioid members were incorporated among the Lagenidiaceae. However, since the Chytridiales are furnished with posteriorly uniflagellate zoospores, the representatives of the Woroninaceae can no longer be placed in that order as now recognized, and they are therefore accorded separate treatment. Owing to the absence of well-defined taxonomic characters, no distinctive name applicable to the group in its entirety is proposed, but as an aid to classification five families are differentiated on the basis of thallus structure and mode of sexual reproduction, i.e., Woroninaceae, Ectrogellaceae, Sirolpidiaceae, Olpidiopsidaceae, and Lagenidiaceae.

Six new combinations are made, including *Olpidiopsis pythii* (Butler) comb. nov.

(*Pseudolpidium butleri*) and *O. gracile* (Butler) comb. nov. (*P. gracile*) [*R.A.M.*, xxiii, p. 114].

The holocarpic, biflagellate Phycomycetes are widely distributed in nature and ubiquitous in host range, and with a view to expeditious reference to the fungi and their substrata a complete host index and bibliography is appended to the monograph.

OREJUELA (C. G.). **New or heretofore unreported species of the higher Ascomycetes from Colombia and Venezuela.**—*Mycologia*, xxxvi, 5, pp. 429–459, 1944.

This annotated list of new or hitherto unrecorded species of the higher Ascomycetes is based largely on recent collections by several persons, chiefly by Chardon and the author in Colombia and Whetzel, Barrus, and A. S. Müller in Venezuela. It comprises 50 species (16 new), 38 from Colombia and 14 from Venezuela, two of them being found in both countries.

MARCHIONATTO (J. B.). **Una nueva especie de hongo: 'Rhinotrichum griseo-roseum, n.sp.'.** [A new species of fungus: *Rhinotrichum griseo-roseum* n.sp.]—*Rev. argent. Agron.*, viii, 4, pp. 277–280, 1 col. pl., 2 figs., 1941. [Received December, 1944.]

The examination of specimens of chilli leaves collected at Orán, Salta, Argentina, in 1940 revealed a profuse, greyish efflorescence covering the lesions induced by *Cercospora capsici* Heald & Wolf and ultimately spreading over the entire lamina. It was found to consist of the effuse, hyaline mycelium of a fungus, which was isolated in pure culture on 1 per cent. potato dextrose agar, identified as an undescribed species of *Rhinotrichum*, and designated *R. griseo-roseum* n.sp. The greyish, erect, continuous or septate conidiophores are provided with unilateral primary branches and opposite secondary ones, the surface of all being denticulate; they arise among the tufts of conidiophores of *C. capsici* and bear innumerable globose, smooth, hyaline conidia, $3\frac{1}{3}$ to 4 μ in diameter. The colours at first assume a greenish colour, which changes to Van Dyke brown and at an advanced stage to greyish-pink, the obverse being yellow or orange. Mutual aversion was manifested by *R. griseo-roseum* and *C. beticola* in mixed cultures.

COUCH (J. N.). **The yeast Nadsonia in America.**—*J. Elisha Mitchell sci. Soc.*, lx, 1, pp. 11–16, 1 pl., 1944.

An account is given of *Nadsonia fulvescens*, found growing abundantly on the sap from stumps of recently cut birch trees in North Carolina.

COKER (W. C.). **The smaller species of Pleurotus in North Carolina.**—*J. Elisha Mitchell sci. Soc.*, lxi, pp. 71–95, 13 pl., 1944.

This is a critically annotated list, preceded by a key, of 22 species of *Pleurotus* occurring in North Carolina, of which three are new and are described without Latin diagnoses.

SUBBA RAO (M. K.). **Report of the Mycologist, 1942–43. Report of the Mycologist, 1943–44.**—*Adm. Rep. Tea sci. Sect. unit. Plant. Ass. S. Ind., 1942–43*, pp. 16–21, 1943; *1943–44*, pp. 8–9, 1944.

In the first of these reports [cf. *R.A.M.*, xxi, p. 47] it is stated that continuous wet weather between June and October in southern India may have encouraged an outbreak of tea leaf disease (*Cercosporella theae*) on many estates. As a result, some estates reported a leafless condition of large areas of tea even after the rains had ceased. From the High Ranges one estate reported a chronic shuck condition leading to a gradual deterioration in yield, associated with *C. theae*. Attacks of the fungus during successive years appeared likely to be a factor of some importance

in areas where deterioration was present, and it was ascertained that *C. theae* can perpetuate itself from season to season on fallen tea leaves. In November sterile perithecia were found in abundance on the under surface of the fallen leaves, which, presumably, had fallen following an earlier attack. Detached, sterile perithecia in culture developed characteristic spores of *C. theae*. No trace of the disease could be detected on the bushes at the time. It was ascertained that in a suitably moist atmosphere the fungus could be brought into activity on fallen litter even in the absence of the sterile perithecia, though the debilitated shoots did not develop any growth of the fungus.

Tea leaves from a pruned field in the Nilgiri district were attacked by a fungus agreeing in essential respects with the description of *Phyllosticta theae* [ibid., v, p. 136; ix, p. 89].

A systematic disease of tea was observed, marked by crinkling and backward curling of the leaves, but showing no necrotic areas in the tissues or roots. No pathogenic agency appeared to be involved.

Wilting of *Chrysanthemum cinerariaefolium* associated with a species of *Fusarium* was recorded from the Nilgiris. *Oidium heveae* was also noted on *Hevea* rubber.

In the second report it is stated that no further control of *Corticium invisum* [ibid., xxi, p. 48] on tea was undertaken. The disease was recorded from a nursery in Travancore. Preliminary work on the control of *Cercosporella theae* [see above] was completed. Mouldy rot of *Hevea* rubber (*Ceratostomella fimbriata*) does not appear to be present in southern India. A leaf disease of cardamoms associated with a species of *Phyllosticta* was recorded from Mysore. A sclerotial disease of rice (? *Sclerotium oryzae*) was also reported.

COSTA (A. S.) & FORSTER (R.). **Nota sôbre a molestia de virus de Fumo denominada faixa dos nervuras.** [Note on the Tobacco virus disease named veinbanding.]. —*Bragantia, S. Paulo*, ii, 2, pp. 56–82, 9 figs., 1942. [English summary. Abs. in *Exp. Sta. Rec.*, xc, 4, p. 492, 1944.]

Seven species of *Nicotiana*, one of *Lycopersicon*, and *Cyphomandra betacea* are added to the list of suspected hosts of the tobacco veinbanding virus in São Paulo, Brazil [*R.A.M.*, xx, p. 606]. President and Green Mountain potatoes inoculated with the virus developed local streak-like symptoms, followed by chlorotic mottling of the young foliage and, at an advanced stage, by leaf-drop streak. The virus is considered to belong to the potato virus Y group.

KALMUS (H.) & KASSANIS (B.). **Reduction by carbon dioxide of susceptibility of Beans to Tobacco necrosis viruses.**—*Nature, Lond.*, cliv, 3916, pp. 641–642, 1944.

Exposure of Canadian Wonder bean plants to atmospheres containing 30 to 60 per cent. carbon dioxide greatly reduced susceptibility to tobacco necrosis viruses. As this reduction can be brought about by exposure after inoculation, the effect is due, presumably, to physiological changes within the cell, and not to the number of entry points opened during the inoculation.

In one test plants exposed immediately after inoculation for 15, 30, 60, and 120 minutes gave, respectively, 46, 39, 17, and 13 per cent. of the number of local lesions produced on the controls. When the plants were exposed for two hours they showed equally reduced susceptibility, whether inoculated immediately before or after exposure.

The changes causing reduction in susceptibility were readily reversed when the plants were returned to air; four hours after exposure, the treated plants were as susceptible as the unexposed controls. Plants inoculated four hours before exposure produced as many lesions as the controls.

As the viruses are unaffected by long exposure to saturated solutions of carbon

dioxide, the effect of the exposure is probably not a direct inactivation of the viruses. Exposure being ineffectual four hours after inoculation, it appears that in this period the virus is normally established in tissues where it multiplies, and some changes in cell metabolism prevent this establishment in the treated plants.

WOODS (M. W.). **Intracellular inclusions in Tobacco mosaic-infected Nicotiana glutinosa and its hybrids.**—*Phytopathology*, xxxiv, 7, pp. 694–696, 1944.

Details are given of inoculation experiments with the tobacco mosaic virus on half leaves of *Nicotiana glutinosa* and an F_2 hybrid (*N. tabacum* var. Turkish × *N. glutinosa*) heterozygous for the necrotizing gene [*R.A.M.*, xvi, p. 417]. The inoculated rinsed leaves were cut transversely into four sectors; one sector from each leaf was kept in an unsealed container in absolute darkness at 27° to 28° C. and the others in water-saturated atmospheres in sealed glass vessels in darkness and at the same temperature under three sets of conditions, viz. (1) in plain air, (2) in a mixture of 73 per cent. oxygen, 17 per cent. nitrogen, and 10 per cent. carbon dioxide, and (3) in 90 per cent. oxygen and 10 per cent. nitrogen. After six days the leaf sectors in (1) and especially in (3) had yellowed noticeably, whereas those in (2) were still green, the necrotizing action of the virus being materially reduced. Leaf sectors in open containers developed solid-necrotic lesions that rapidly dried out. Both crystalline inclusions and X-bodies were present in the epidermal and mesophyll cells in lesions from leaves held in all the sealed vessels, being most abundant in (2), whereas none occurred in leaf sectors in open containers (with low humidity). The hexagonal crystals observed in *N. glutinosa* and its hybrid in tests were essentially similar to those found in systemic lesions in Turkish tobacco, except for a lack of stability in the cell involving rapid dissolution after five minutes in tap water at 25° to 28°.

The formation of the two types of structures under discussion appears to be associated with a diminution of the necrotic action of the virus on the cells under the influence of such factors as high humidity, increased carbon dioxide concentration, and darkness, which presumably operate similarly to sodium cyanide in the inhibition of virus multiplication [ibid., xix, p. 437].

FRAMPTON (V. L.) & TAKAHASHI (W. N.). **Electrophoretic studies with plant viruses. I. Tobacco mosaic virus.**—*Arch. Biochem., N.Y.*, iv, 2, pp. 249–253, 3 diags., 1944.

The Longsworth scanning patterns (*J. Amer. chem. Soc.*, lxi, p. 529, 1939) obtained with extracts from healthy tobacco leaves up to three months old at P_H 7·5 indicate the presence therein of three protein components, while similar extracts from mosaic-diseased plants contain an additional protein, the appearance of which coincides with the development of symptoms in the infected foliage. This substance is believed to be the virus itself. The normal proteins evidently undergo no change, either of nature or concentration, as a result of the disease.

GLASSCOCK (H. H.) & WARE (W. M.). **Alternaria blight of Tomatoes.**—*J. Minist. Agric.*, li, 9, pp. 417–418, 1944.

On 22nd September, 1944, a plantation of 1¼ acres of outdoor tomatoes of the varieties Potentate, Ailsa Craig, and E.S.1 at Ramsgate, Kent, showed most of the leaves to be dead and shrivelled, while the stems were covered with dark brown patches and spots, and many of the fruits were falling and rotting. A few days later, specimens of foliage and fruit from a similarly affected nursery in West Sussex were received. The fungus associated with the condition in both localities was critically examined and found to agree in its characters, the symptoms produced on the host, and in the formation of a wine-red colour in the agar medium of cultures with *Alternaria solani*. W. Buddin subsequently reported that the

disease was present in the Isle of Wight. These appear to be the first outbreaks of the disease in Britain.

[A preliminary account of this work appeared in *Nature, Lond.*, cliv, 3916, p. 642, 1944.]

HICKMAN (C. J.). **The perithecial stage of Didymella lycopersici.**—*Nature, Lond.*, cliv, 3918, p. 708, 1944.

The perithecial stage of *Didymella lycopersici* was observed in October, 1943, on a single outdoor tomato plant at Long Ashton, mature perithecia also being found on three subsequent occasions. The evidence showed that perithecial development in *D. lycopersici* may occur at any time of the year. The constant presence of these organs near the soil suggests that moisture supply and, possibly, soil nutrients may be factors governing their formation. This appears to be the first record of the occurrence of perithecia of this fungus under natural conditions on the host. The observations were mainly confined to outdoor plants, but it is not unlikely that the perithecial stage also occurs on glasshouse tomatoes.

BERKELEY (G. H.) & RICHARDSON (J. K.). **Tomato diseases.**—*Fmrs' Bull. Canad. Dep. Agric.* 122, 18 pp., 4 pl., 1944.

Up-to-date information is presented on the fungal, bacterial, physiological, and virus diseases of tomatoes in Canada and their control.

RICHARDSON (J. K.) & BERKELEY (G. H.). **Basal rot of Tomato.**—*Phytopathology*, xxxiv, 7, pp. 615–621, 2 figs., 1944.

The fungi predominating in the 1,700 isolations on potato dextrose agar from tomato plants affected by a hitherto unreported basal rot in the London, Ontario, district of Canada in 1936–7 and 1942 were species of *Trichoderma*, *Fusarium*, *Cylindrocarpon*, *Pythium*, and an unidentified organism herein designated *TR*. The last-named developed more consistently, though not more frequently, than the other fungi from the various types of plated material, thus suggesting an etiological connexion with the disease, which may reduce the crop by up to 50 per cent. Soil inoculation experiments with *TR*, moreover, resulted in the appearance of the typical symptoms of the rot, including premature shedding of the leaves from the base upwards, dwarfing, a marked tendency to wilt during periods of excessive transpiration, necrotic lesions and 'cankers' on the stalk and roots, and a russeting of the epidermal root tissues.

TR grows slowly, requiring three to four weeks to cover the surface of a 10 cm. Petri dish. The aerial mycelium is compact-cottony, smooth, or slightly tufted, pale grey, at times faintly pink-tinged, the reverse of the colony being zonate, greyish-brown to greenish-black, with a narrow, light-coloured margin. At maturity the mycelium is 2 to 4 μ in diameter, closely septate, constricted at or rarely between the septa, and presenting the appearance of chains of irregular, thin-walled chlamydospores.

Effective control of the disease in the Grand Rapids variety was secured by soil treatment with steam, chloropicrin (applied by means of a Larvajector at dosages of 2½ c.c., 6 to 8 in. deep and 10 in. apart), or formalin (¾ gal. per sq. ft.). In 1941 the weight of the plants in the sterilized plots ranged from 9·9 to 10·6 lb. compared with 5·5 lb. in the untreated controls, the corresponding figures for the 1942 tests being 2·6 to 3·2 and 1·2 lb., respectively.

PEIRIS (J. W. L.). **A leaf curl disease of Tomato and its relation to some other plants.**—*Trop. Agriculturist*, c, 1, pp. 14–19, 2 pl., 1944.

Tomatoes growing in Ceylon are commonly affected by a condition causing general stunting, curling and bronzing of the leaves, and, sometimes, a fatal die-

back. Investigations [which are described] demonstrated that the malformation was due to injury by a species of mites, and that other hosts than tomato are also affected.

Tomato plant defoliation.—*Food Packer, N.Y.*, xxv, 10, p. 43, 1944.

It has been observed in home gardens, where tomato fruits are removed as soon as they ripen, that late-season defoliation [*R.A.M.*, xxii, p. 331] (a major problem in the eastern and mid-western tomato-producing areas of the United States) is less prevalent than in the field, where over-ripe fruits are allowed to accumulate. Tests were accordingly carried out at the Illinois, New York (Geneva), and Indiana Experiment Stations to determine the practicability or otherwise of this method of combating the trouble, but in no case did the effects of removing the over-mature fruit warrant the extra cost involved. At Geneva the application to the crop of 44 per cent. copper fungicide reduced the incidence of *Septoria* [*lycopersici*] from a maximum of 83·6 to one of 10·7 per cent. At Lafayette, Indiana, where the fungus was also prevalent and serious towards the close of the season, the amount of defoliation in the plots treated with a copper-lime dust after each rainy period ranged from 47·8 to 62·6 per cent., compared with 65·1 to 81·4 per cent. in the controls.

RUDOLPH (B. A.). **The unimportance of Tomato seed in the dissemination of Verticillium wilt in California.**—*Phytopathology*, xxxiv, 7, pp. 622–630, 1944.

It is inferred, from the largely negative results of experiments on the transmissibility of *Verticillium albo-atrum* by way of tomato seed, that this mode of perpetuation of the fungus is without importance, at any rate under Californian conditions.

HENRY (B. W.). **Chalara quercina n.sp., the cause of Oak wilt.**—*Phytopathology*, xxxiv, 7, pp. 631–635, 1 fig., 1944.

Chalara quercina n.sp. is the name proposed for the agent of a destructive wilt affecting *Quercus alba*, *Q. borealis*, *Q. coccinea*, *Q. macrocarpa*, and *Q. velutina* [see next abstract] in Illinois, Iowa, Minnesota, and Wisconsin. On 2 per cent. malt agar the fungus produces a fluffy mycelial mat, 1 to 3 mm. in height, grey to olive-green with occasional tan patches; septate, branched, subhyaline to brown sterile hyphae, 2·5 to 6 μ in diameter, from which the conidiophores are poorly differentiated; tan to black, irregular, loosely knit sclerotia, up to 2·5 cm. in diameter (not consistently present); subhyaline to brown spore-bearing cells, terminating branches of variable length, 20 to 40 by 2·5 to 4·5 μ; and endogenous, hyaline, cylindrical, continuous, catenulate conidia, truncate at both ends, 4 to 22 by 2 to 4·5 (mean 6·5 by 3) μ. The differences between the new species and the four other members of the genus (all saprophytes) on oak, viz., *C. affinis*, *C. fusidioides*, *C. heterospora*, and *C. setosa*, are briefly indicated. The minimum, optimum, and maximum germination temperatures for *C. quercina* are 8°, 24° to 28°, and 32° C., respectively.

HENRY (B. W.), MOSES (C. S.), RICHARDS (C. AUDREY), & RIKER (A. J.). **Oak wilt: its significance, symptoms, and cause.**—*Phytopathology*, xxxiv, 7, pp. 636–647, 2 figs., 1944.

The presence of oak wilt (*Chalara quercina*) [see preceding abstract] has been confirmed, by positive cultural studies, in 23 counties of Wisconsin, five of Minnesota, two of Iowa, and one of Illinois, the red (*Quercus borealis*) and black (*Q. velutina*) species being the most susceptible and sustaining irretrievable damage. No correlation was observed between the occurrence of the pathogen and such factors as soil type, reaction, or nutritional content.

The preliminary crinkling and pallor of the foliage was often followed by a progressive bronzing or browning of the leaf blade from the margins and apex towards the midrib and base, accompanied in the case of young leaves by pronounced drooping. Defoliation of varying extent took place at any stage of infection of mature leaves. The symptoms usually involved the entire tree within a few weeks. The secondary foliage put forth by the trunk and larger branches successively wilted and died. A brown to black discoloration of the twig sapwood was commonly present, but did not constitute a reliable diagnostic character.

C. quercina was isolated from 116 out of 122 wilted trees and inoculated with positive results into 74 out of 90 woodland oaks.

CLAPPER (R. B.). **Improved cork-borer method for inoculating trees.**—*Phytopathology*, xxxiv, 8, pp. 761–762, 1 fig., 1944.

Details are given of an improved device facilitating the application of the cork-borer method (*Phytopathology*, xxiii, pp. 487–488, 1933) to the large-scale inoculation of trees. In the summer of 1943, for instance, about 3,300 inoculations were performed on 1,800 chestnut hybrids, and in operations of this order the elimination of even one movement effects a considerable saving of time. The use of the ordinary cork-borer necessitates picking up the accessory wire or rod-plunger to punch out the cork plug, whereas with the improved instrument the thumb of the hand holding the borer presses against the copper, aluminium, or plastic plunger, which is introduced into the tube through the upper end and fitted with a spring in such a way as to form an integral part of the appliance.

LARGE (J. R.). **Web blight of seedling Tung trees tentatively identified as the Rhizoctonia stage of Corticium microsclerotia.**—*Phytopathology*, xxxiv, 7, pp. 648–649, 1 fig., 1944.

A fungus isolated on water and Lima bean agars from the pale tan lesions, 0·2 to 2 cm. in diameter, covered in rainy weather with a fine hyphal web bearing tufts of light brown sclerotia, on the basal leaves of tung [*Aleurites fordii*] seedlings in Louisiana in 1942 and 1943 produced sclerotia measuring 80 to 300 by 80 to 200 (average 200 by 150) μ, on the basis of which it is tentatively identified as the *Rhizoctonia* stage of *Corticium microsclerotia*. Inoculation experiments on beans with these organs resulted in the development of the typical web blight symptoms described by Weber as due to *C. microsclerotia* [*R.A.M.*, xix, p. 3], among the 24 hosts of which, however, *A. fordii* was not included.

MCLEAN (D. M.). **Histo-pathologic changes in the phloem of American Elm affected with the virus causing phloem necrosis.**—*Phytopathology*, xxxiv, 9, pp. 818–826, 3 figs., 1944.

Following the inoculation of healthy two-year-old American elms in 'complete' aqueous culture solutions with the phloem-necrosis virus [*R.A.M.*, xxii, p. 45] by means of patch-grafting diseased bark tissue on the stem bases, the fibrous roots first undergo necrosis, which then progresses into the larger roots and may finally involve the inner phloem of the lower portion of the stem. Microscopic pathological alterations in the primary phloem tissue of the root include hypertrophied cells and nuclei in proximity to the mature sieve-tubes, succeeded by hyperplasia and eventual crushing of the sieve-tube and companion cells in the older tissues. In the phloem of the older roots and stem the most conspicuous microscopic changes appear in the hyperplasia and hypertrophy of the parenchyma.

A yellow to brown discoloration of the phloem tissue develops in the necrotic roots and usually proceeds into the stem and lower branches before the death of the tree. A faint odour of wintergreen emanates from the freshly cut diseased tissues, but not from comparable healthy material.

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SWINGLE (R. U.). **Chlorotic dwarf of Eastern White Pine.**—*Plant Dis. Reptr*, xxviii, 26, pp. 824–825, 1944. [Mimeographed.]

Chlorotic dwarf of *Pinus strobus* is a chronic disease found since 1936 throughout Ohio and more recently in parts of Indiana and West Virginia. The condition also occurs in parts of Kentucky, Virginia, Delaware, Pennsylvania, Michigan, New York, and the New England States. It is prevalent in 2- to 15-year-old plantations in Ohio, and is probably the most important disease of white pine in this State. It is found in mixed and pure stands, but *P. strobus* is the only species affected. During 1943, 20 per cent. of the trees in one eight-year-old plantation in central Ohio were found to be attacked. As a rule, the decline lasts for three to five years or more, after which death ensues. Diseased trees are usually widely distributed, individually or in small groups, throughout affected plantations. These small groups often consist of trees in different stages of decline. Individual diseased trees surrounded by healthy ones commonly occur some distance away from other affected individuals. In one plantation, two trees were occasionally found planted together, one of which was healthy and the other diseased.

The condition is characterized by stunting of the roots and top and greenish-yellow to yellow foliage. In the early stages, needles formed the year before turn yellow and drop prematurely. The current year's needles are light green to yellowish-green and sometimes are reduced in length. In hot, dry periods they often develop tipburn.

Current growth of the central leader and lateral branches may be reduced. Each year, the dwarf symptoms become intensified. Dwarfing of the needles, the central leader, and the lateral branches becomes pronounced. The needles are greenish-yellow to yellow, and one-quarter to three-quarters normal size. Premature loss of year-old foliage continues, and tipburn of current needles is common. Annual growth of the central leader may vary from 0·5 to 6 in., as against 20 or 30 in. for near-by healthy trees. The bark of the upper trunk and branches is olive-green to yellow-green and somewhat wrinkled or shrivelled. Raised pitch pockets or blisters are generally present on the lower stem. There is no external flow of resin. In advanced stages, there is pronounced stunting of the roots. Fibrous roots are sparse and most of them are found in the upper 6 in. of soil. Experiments are in progress to determine whether the disease is infectious.

DAY (M. W.) & STRONG (F. C.). **A basal stem canker of Red Pine.**—Reprinted from *Quart. Bull. Mich. agric. Exp. Sta.*, xxvi, 4, 3 pp., 1 fig., 1944.

Red pines (*Pinus resinosa*) at the Dunbar Forest Experiment Station, near Sault Ste. Marie, Michigan, have been observed during the last three years to bear cankers on the stem bases, directly above the roots and at or slightly below soil-level. The tree is eventually girdled and gradually dies, its appearance in the summer preceding death being characterized by short, pale green needles on the current year's growth, retarded twig development, and a swelling of stem just

above the canker due to the interrupted transport of nutrients and their consequent accumulation in the tissues of this region. A considerable quantity of resin may be found on the surface of the canker. The disease is also present in a red pine plantation, dating from 1928, on poorly drained areas of an old field of Bruce sandy loam in Chippewa County, where the original cover appears to have consisted mainly of tamarack (*Larix laricina*) with an admixture of black spruce (*Picea mariana*).

The available information points to a weakly parasitic soil fungus as the agent of the canker, but so far the results of inoculation experiments with a *Coniothyrium* and a colourless, non-sporulating organism isolated from the diseased tissues have been negative.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. XV.**—*Pap. Mich. Acad. Sci.*, xxix (*1943*), Part I, pp. 85–109, 6 pl., 1944.

Continuing his critical studies on the resupinate Polypores of the Great Lakes region of the United States [*R.A.M.*, xxii, p. 334], the author discusses the damage inflicted, notably in the tropics, by the white group of wood-destroying fungi (*Poria*, *Trametes*, and *Polystictus* spp.) on timber used for military purposes. Long periods of transit are inevitable in war time, while the methods of handling war material are increasing in complexity, so that information is urgently required concerning the growth rate of these pathogens and the conditions favouring their development. Two further groups, the brown lignicolous fungi and those other than white or brown, are reserved for subsequent investigations.

The initial classification of a fungus, on the basis of its mycelial characters, is made by a comparison of the unknown culture with a stock collection from named species, but the number of resupinate Polypores that has been assembled from the vast area of the North American continent is still far from complete, involving the risk that a particular unidentified species may not yet be represented among the available material. Moreover, if pore formation does not occur in an isolate from wood, it may not be a Polypore but a representative of some other family, such as the Thelephoraceae. The five cases of flask cultures of various fungi on red gum [*Liquidambar styraciflua*] test pieces, duplicated on white pine blocks, comprised in the collection of the School of Forestry and Conservation of the University of Michigan, has been found most useful for comparative purposes.

Wherever possible, the determination of a species should be based on structures of the fruiting body, whereas cultures are particularly helpful in race identification. In the compilation of a key, the microscopic elements possess the advantage of relative stability over such features as colour, texture, and growth rate and form, while further important characters are the presence or absence of clamp-connexions, chlamydospores, conidia or oidia, staghorn and other types of mycelial branching, hyphal diameter, setal hyphae, and setae. In the white group of Polypores under investigation, however, clamp-connexions are of such general occurrence as to afford little help in the construction of a key. They are almost invariably absent, on the other hand, from the brown group, but the white and brown Polyporaceae are so easily distinguishable on a colour basis alone as to obviate the need for microscopic examination of the mycelium. For specific differentiation within the brown or white groups microscopic structures, such as the spines on the mycelium of *Poria spiculosa* [ibid., xxi, p. 270], provide definite criteria. The use of certain other microscopic characters may be limited by variations in their incidence associated with environmental factors, e.g., the age of the culture, thickness of the medium, and degree of prevailing humidity, the last-named being well known to influence not only the abundance but the type of spore production.

Turning to physiological reactions, the Bavendamm oxidase test, involving the addition to malt agar cultures of 0·5 per cent. tannic or gallic acid [cf. ibid., viii,

p. 281], may prove helpful in the separation of brown- from white-rotting fungi; the method, however, is time-consuming and laborious, and a decision as to the colour of the decay may usually be reached by examination of the wood from which the isolation was made. Records of data on growth rate, mycelial development on wood, and the effect of the fungus on its host are of value not only for identification purposes in a key, but also from the pathological standpoint. If wood-block cultures are not available for comparative studies, the microscopic and other features enumerated in the key are, for the most part, typical of the fungus in fortnight-old Petri dish cultures. In cultures of *Fomes annosus* the almost invariable occurrence of conidiophores with spiked heads, discernible under the microscope, is a distinctive specific character which is used as the first element in the separation of this fungus from other members of the white group.

A key is appended, based on Petri dish and one-year-old wood-block cultures, of the principal white resupinate Polypores of the Great Lakes region.

DILLON WESTON (W. A. R.). **Club root disease.**—*J. Minist. Agric.*, li, 9, pp. 420–422, 9 figs., 1944.

A brief, popular account is given of the symptoms and control of club root of crucifers caused by *Plasmodiophora brassicae* [*R.A.M.*, xxiii, p. 283]. It is recommended that roots of all affected plants should, if possible, be burnt. Where this is not possible, rotted roots and dung from animals fed on a diseased crop must not be placed on the manure heap; a diseased root crop should be fed off on the affected field or it may be taken to a permanent pasture or a field that is unlikely to be broken up for some years. Affected soil should be treated with freshly slaked burnt lime, hydrated lime, or ground quicklime, applied as soon as the crop is cleared and intimately mixed with the soil. A cruciferous crop should not be planted for a long time, and acid fertilizers should be avoided.

GIDDINGS (N. J.). **Additional strains of the Sugar-Beet curly top virus.**—*J. agric. Res.*, lxix, 4, pp. 149–157, 4 figs., 1944.

Six additional strains of the sugar beet curly-top virus [*R.A.M.*, xvii, p. 786] have now been segregated, using 47 plant species and varieties as differential hosts, besides numerous varieties of cultivated sugar beet. Strains 5, 6, and 10 were obtained in 1937 from *Nicotiana glauca* which had grown in natural breeding areas of *Eutettix tenellus*, near Tracy, California. Strain 7 was obtained from diseased spinach in a commercial field west of Hemet, California. Strain 8 came under test in 1936 as a result of inoculations by J. M. Wallace on Red Mexican bean (*Phaseolus vulgaris*) with a colony of viruliferous leafhoppers carrying a mixture of unknown virus strains. Strain 9 was obtained earlier from a similar colony by inoculations on a resistant beet.

Inoculations into young susceptible beets with strains 5 and 6 gave little or no distortion of the leaves, which in many cases were deep green. Extreme dwarfing resulted, with a very high percentage of mortality. Strain 5 was most readily differentiated from strain 6 by the more severe symptoms the former induced on Turkish tobacco. Strain 5 also appeared to be more virulent than strain 6 on *N. glutinosa*, whereas strain 6 seemed more virulent than strain 5 when inoculated into Red Mexican bean, University of Idaho No. 15 selection of Great Northern bean, and the highly resistant sugar beet variety 68. Strain 7 is the least virulent of all those so far selected; it is the only strain that has produced no symptom on sugar beet 68. It does not infect Turkish tobacco and seldom infects *N. glutinosa*. Nevertheless, this strain caused considerable injury. Strains 8 and 9 showed similar virulence on most host plants tested, but strain 9 infected a higher percentage of beet 68 than strain 8 and produced more severe symptoms on Red Mexican bean. Strain 10, when inoculated into young susceptible sugar beet

plants, produced symptoms like those of strains 5 and 6, but much less severe, very few of the infected plants dying. The general host range was found to be the same as that of strains 5 and 6, but the symptoms were less severe on all of them, with the possible exception of tomato.

Each of these strains showed a high degree of stability, though any one could induce symptoms distinctly different in severity. For instance, 20 susceptible plants infected by strain 7 and kept under identical environmental conditions might show three or four plants with symptoms graded 2, a few graded 1·5, and the rest 1. Arrangement of the strains according to ascending amount of injury on susceptible sugar beet would be approximately 7, 2, 4, 10, 1, 8, 3, 9, 5, 6, and on resistant beet 68 would be 7, 10, 3, 8, 5, 6, 4, 2, 9, 1. Strains 2, 4, and 7 in no case produced symptoms on Turkish tobacco, on which strain 10 gave mild symptoms, strain 6 rather severe symptoms, and strains 1, 3, 5, 8, and 9 very severe symptoms.

The 10 strains described are considered to form part of a much larger group with the same vector, host range, and symptoms, which may be designated *Ruga verrucosans* Carsner and Bennett. Owing to their common characteristics, however, and also as a matter of convenience, it seems best to refer to them by strain number.

MURPHY (A. M.). **Production of heavy curly-top exposures in Sugar-Beet breeding fields.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 459–462, 1943.

Brief notes are given on five general methods of experimentally inducing curly-top epidemics in sugar beet-breeding fields, viz., (1) caging leafhoppers on beets, a laborious, expensive, and slow method; (2) planting diseased mother beets, open to the danger that these may have mosaic or other diseases; (3) releasing viruliferous leafhoppers, the chief difficulty with this method being to obtain adequate numbers of the insects; (4) interplanting with a susceptible variety, or when the vector is prevalent with a variety of intermediate resistance able to persist longer, and (5) late planting. Another method now being tested is to increase the exposure to curly top by providing suitable host plants (either wild or cultivated) to harbour the leafhoppers over the winter. The seed of weed hosts, such as mustard, is planted during autumn in or near the field that is next to be used for the sugar beet-breeding plots. As a cultivated host plant, spinach has given promising results. The yields of the varieties R. & G. Old Type, U.S.1, U.S.33, U.S.12, U.S.22, and Improved U.S.22 under drastic test in Idaho in 1941 were 0·73, 6·31, 8·40, 11·25, 14·32, and 16·61 tons per acre, respectively [cf. *R.A.M.*, xxi, p. 316]. As the severity of curly top varies widely from year to year it is unwise to depend entirely upon natural infestation in breeding tests.

BREWBAKER (H. E.). **Mosaic and seed production.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 381–385, 1943.

In a three-year study of the effect of mosaic on seed production by sugar beets [*R.A.M.*, xxii, p. 236], 1,461 plants were classified for mosaic on the basis of no infection, light, medium, and heavy, and for weight of seed per plant, germination, and number of seedballs per ounce of seed. Excluding two lots that failed to germinate, the results showed that for the four classes, respectively, the average weight of seed per plant was 5·75, 5·52, 4·75, and 3·95 oz., the percentage germination 80·4, 80·9, 77·5, and 75·1, and the average number of seedballs per ounce of seed 1,747, 1,775, 1,825, and 1,836. In weight of seed per plant the average loss due to light, medium, and heavy mosaic was, respectively, 4, 17·4, and 31·3 per cent., while for medium and heavy infection the loss in average germination was 3·6 and 6·6 per cent., respectively. The seedball count per ounce of seed increased in almost direct proportion to the decrease in germination. It is concluded that

in any sugar beet improvement programme the seed-production work should be segregated some distance from the testing and selection plots in areas where mosaic is present.

ISAKSSON (A.). **A Botrytis form causing storage rot in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942,* pp. 423–430, 3 figs., 1943.

In 1941, a disease previously not recorded by the Great Western Sugar Company and possibly new to the sugar beet industry as a whole was found on the roots of sugar beet in a storage cellar at Longmont, Colorado. Most of the beets had been tested for sugar content and it was evident that the wounds caused by the test drill or by carving out diseased tissue from moderately affected roots, as well as broken root-tips, served as the preferred mode of entry. Diseased roots showed a uniform invasion and discoloration of the tissues followed by a general collapse. Isolations from affected material yielded a *Botrytis* of the *B. cinerea* type. Wound inoculations, with resulting rot and recovery of the fungus, showed that it was strongly pathogenic to sugar beet roots under the experimental conditions.

LEACH (L. D.) & BAINER (R.). **Seed treatment of segmented seed.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942,* pp. 220–227, 5 graphs, 1943.

Experiments carried out in California in the greenhouse to determine the protective and toxic effects of fungicidal treatments of segmented sugar beet seed demonstrated that such seed responds similarly to whole seed, but requires a rather higher dosage. Even under moderately severe infestation of the soil by *Pythium ultimum* and *Rhizoctonia* [*Corticium*] *solani* a 1·5 per cent. dosage of ceresan or a 0·5 per cent. one of new improved ceresan should afford adequate protection. Red copper oxide and spergon were less effective.

BUCHHOLTZ (W. F.). **Crop rotation and soil drainage effects on Sugar Beet tip rot and susceptibility of other crops to Aphanomyces cochlioides.**—*Phytopathology,* xxxiv, 9, pp. 805–812, 1 fig., 1 diag., 1944.

The high incidence of sugar beet tip rot (*Aphanomyces cochlioides*) in some fields and its virtual absence from others in Hancock County, Iowa, during 1937, 1938, and 1939 [*R.A.M.*, xxiii, pp. 464, 469] suggested an investigation of the reactions to the pathogen of certain crops commonly grown in rotation with beets, namely, maize, oats, soy-beans, lucerne, and sweet clover [*Melilotus*], and of the relation of the disease to the position of tile drains. None of these crops contracted the rot in infected soil, while in another series of tests barley and red clover also remained free from the fungus, which did, however, attack two ubiquitous weeds, pigweed (*Amaranthus retroflexus*) and lamb's quarters (*Chenopodium album*); flax sustained a reduction of germination in one experiment, but gave no evidence of susceptibility in another.

It was observed in fields with a varying incidence of tip rot that in no case did the disease affect the first beet crop in a given field, that the third crop in eight years or less suffered severe damage, and that beets following lucerne were uniformly free from severe infection by *A. cochlioides*. On the basis of these data it was concluded that three-to-four-year intervals between beet crops should ordinarily prevent heavy losses from tip rot, though an intervening period of six or more years, including three or four seasons of lucerne, may be a wise precaution in a field where the disease has been virulent.

A definite connexion between the proximity of tile drains and less than the average incidence of tip rot was established at Kanawha in 1938, while a relationship was indicated, but not definitely established, between excessive soil moisture and the severity of the fungus.

AFANASIEV (M. M.), MORRIS (H. E.), & CARLSON (W. E.). **The effect of preceding crops on the amount of seedling diseases of Sugar Beets.**—Abs. in *Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 435–436, 1943.

In this abstract the authors give the results of field and greenhouse investigations of the effect of continuous fallow and of oats, maize, beans, potatoes, beets, and lucerne on the development of seedling diseases of sugar beets. The soil, from a field cropped for three years with lucerne, was planted to beets in the greenhouse to test its disease potentialities. The beets were harvested when the third pair of leaves were developed, and the crops listed above were then planted in the soil and harvested in about three months, after which the soil was again sown to beets. Readings of healthy and diseased beet seedlings were made at frequent intervals.

On an average for two years, the least amount of seedling diseases (23·6 per cent.) occurred after maize, and the highest (87·8 per cent.) in the control. Seedling diseases of beets occurred in progressively increasing amounts as the beets were planted after maize, potatoes, lucerne, beans, beets, and the control, respectively.

In field studies, sugar beets planted in uniform soil in which potatoes, beans, beets, and lucerne had grown for five years showed the smallest incidence of seedling diseases (11·1 per cent.) following potatoes and the greatest following beets (74·2 per cent.) and lucerne (61·2 per cent.). Beets after beans showed 27·7 per cent. disease. From each plot 250 beet seedlings were analysed for nitrogen and phosphorus, and it was found that both decreased as seedling diseases increased; the highest amounts of these elements were found in the beets on the potato plot and the smallest on the beet plot.

AFANASIEV (M. M.) & CARLSON (W. E.). **The relation of phosphorus and nitrogen ratio to the amount of seedling diseases of Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 407–411, 1 graph, 1943.

In an investigation under greenhouse conditions of the effect of different phosphorus to nitrogen ratios on the development of young sugar beets and on the occurrence of diseases among them [cf. *R.A.M.*, xxi, p. 510; xxii, p. 508], a basic application was made of 20·8 lb. treble superphosphate containing 9·6 lb. phosphorus, and 62·3 lb. calcium nitrate containing 9·6 lb. nitrogen, or equivalent amounts of ammonium sulphate were used per acre as a side-dressing. After this, three different series of ratios were used: treble superphosphate in combination with calcium nitrate, treble superphosphate with ammonium sulphate, and treble superphosphate, ammonium sulphate, and manure (16 tons per acre). In each series there were seven different phosphorus (P_2O_5):nitrogen ratios, i.e., 0:3, 1:3, 1:2, 1:1, 2:1, 3:1, 3:0, and 0:0.

The results showed that seedling-disease incidence was lowest with treble superphosphate, ammonium sulphate, and manure, and highest with treble superphosphate and ammonium sulphate. There was a high correlation of the amount of seedling diseases in individual ratios in all series. The lowest amount was in the P:N ratios of 1:3 and 1:2 and the highest in the 3:0 and the control. The heaviest plants in all series were in the P:N ratios 1:3 and 1:2, and the smallest in the ratios 0:3 without manure, 3:0, and the control.

When calcium nitrate was incorporated in the fertilizer the amount of seedling disease was less than when ammonium sulphate was used and under field conditions the difference would probably be greater. When manure was added to artificial fertilizer the amount of disease was low in all ratios.

The data show the importance of balanced fertilization both as an aid in controlling seedling diseases of sugar beets and as a means of securing maximum yield under given environmental conditions.

SERGEANT (M. W.). **The effect of field conditions and of field practices on the development of black root in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, p. 466, 1943.

A study of 124 sugar beet fields affected with black root in 1939, 1940, and 1941 showed that fields planted late or replanted and those with low fertility or poor drainage showed relatively poor recovery from black root. The percentage saved was highest after cultivated crops of the kinds that are generally fertilized, such as many beans, potatoes, tomatoes, etc.; next in value came legumes, maize, and small grains; beets after beets were a total loss.

Among remedial treatments, immediate aeration with a rotary hoe, weeder, or spike-tooth harrow saved 68 per cent. of the crop, the use of a roller or cultipack saved 34 per cent., delayed treatment of any kind saved 24 per cent., and no treatment resulted in a loss of all but 13 per cent.

COONS (G. H.), KOTILA (J. E.), & BOCKSTAHLER (H. W.). **Black root diseases of Sugar Beet in 1941.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 436–437, 1943.

In experiments on the control of seedling diseases of sugar beet at East Lansing, Michigan, in 1941, seed treatment with commonly used mercury and copper disinfectants gave significantly better initial stands, but enough plants were available at thinning in the untreated plots to give a subsequent yield of roots not significantly below the treated.

In a crop-sequence test at Holgate, Ohio, stands of sugar beet following soy-beans or clover were significantly better than those following sweet clover [*Melilotus*], but the stand in this last sequence was adequate. Acre-yields of roots when sugar beets followed sweet clover or soy-beans were better than when the first-named followed maize, but the quality of the roots following maize compensated for the reduced yields. The experiment again demonstrated the beneficial effect of a preceding maize crop in repressing pathogenic organisms which attack young sugar beets.

GREEN (J.). **Phosphorus and nitrogen deficiency symptoms in Sugar Beets.**—*Proc. Amer. Soc. Beet Technol., 1942*, pp. 101–102, 1943.

Combined deficiency of phosphorus and nitrogen produces typical bronzing in leaves of sugar beet. Analyses of affected and normal leaves showed the former to contain 1·129 gm. nitrogen and 0·159 gm. phosphorus as against 1·826 and 0·276 gm., respectively, for the latter. Bronzing occurs on individual beets scattered about the field, which show a genetic weakness or are unable to thrive on a given level of plant food. The apparently normal beets in the same field have grown under the same limited conditions, but without developing bronzing. The small average showing extreme deficiency of either element or both gives growers serious concern, but the large area over which moderate deficiencies occur presents a graver problem, because here, though the yield may be reduced by only two to four tons an acre, the total loss is great.

COONS (G. H.), STEWART (D.), CULBERTSON (J. O.), DEMING (G. W.), GASKILL (J. O.), LILL (J. G.), & NUCKOLS (S. B.). **Report on 1941 tests of U.S.200 × 215, U.S.215 × 216, and other varieties arising in leafspot-resistance breeding investigations of the U.S. Department of Agriculture.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 356–364, 1943.

During 1941, further agronomic evaluation tests were carried out on U.S.200 × 215 and allied varieties of sugar-beet arising in breeding work for leaf spot [*Cercospora*

beticola] resistance [cf. *R.A.M.*, xxi, p. 114]. The results showed that in the absence of leaf spot, the Synthetic Check variety is a strong competitor to U.S.200×215, but it falls below the latter when leaf spot is present. The new variety U.S.215×216 was found to be more resistant and higher in sucrose than U.S.200×215, and it may well replace the latter as seed stocks become available. U.S.216×a high-yielding, moderately resistant inbred (8–266–0) and U.S.215× 8–419–0, a high-sucrose and highly resistant selection from Rovigo–581 showed excellent promise.

In general, the results showed that many varieties, including those arising in the breeding work of sugar beet companies, are reaching a high level of resistance to leaf spot and are making an excellent showing. In many cases, tests of greater precision, carried out over a long period, will be required before it can be decided which are the most outstanding. In areas where leaf spot is prevalent, breeding work must concentrate on the attainment of high resistance without loss of high productivity.

PERSON (L. H.). **The occurrence of a variant in Rhizoctonia solani.**—*Phytopathology*, xxxiv, 8, pp. 715–717, 1 fig., 1944.

A sector variant in an isolate of *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xviii, p. 494] from beans at Baton Rouge, Louisiana, was compared with the original culture on bean pod agar at a temperature range of 15° to 34° C. in respect of growth rate and pathogenicity. The parent developed more rapidly than the mutant at 20° and 24°, at about the same rate at 29°, and rather more slowly at 34°, the diameter of the former after 50 hours at the four temperatures (average of two tests) being 59, 88, 83, and 65 mm., respectively, while the corresponding dimensions for the latter were 47, 76, 83, and 69 mm., respectively. The variant was less pathogenic than the original culture to beans and other legumes, judging both by the severity of stem lesions and the percentage of stands in inoculated soil. Thus, taking 0 to represent no lesions and 4 to indicate destruction of the plants, the degrees of infection by the parent and mutant were 2·21 and 1·01 for beans planted in inoculated soil and 3·13 and 1·69 for the same host in soil inoculated after emergence, the stand percentages being 52 and 69, respectively, compared with 84 for the controls. In further tests, the stand percentages (average of two tests of 100 seeds each) of beans, soy-beans, cowpeas, and English peas in soil inoculated with the parent culture were 63, 1, 40, and 0, respectively, the corresponding figures for the variant being 78, 36, 76, and 81, and for the controls 92, 56, 94, and 94, respectively.

SMITH (M. A.). **Bacterial soft rot of Spinach.**—*Phytopathology*, xxxiv, 8, pp. 747–752, 1 fig., 1944.

Between 1936 and 1943 bacterial soft rot of spinach was responsible for the bulk of the decay in consignments of this product from all regions inspected at Chicago, averaging 40 per cent. for each carload. The results of comparative morphological, cultural, biochemical, and pathogenic studies to verify the common assumption that the agent of the disease is *Erwinia carotovora* using three isolates from spinach and two authentic isolates of *E. carotovora* from potato, indicated that this species is concerned in the rot of both vegetables, differences in carbon metabolism of the spinach organism (failure to ferment maltose, sorbitol, and dulcitol) being insufficient to justify its differentiation from the *E. carotovora* isolates. Isolates from rotted spinach proved to be capable of attacking potatoes. In the case of spinach infection may occur either through injured or uninjured leaves. The disease may be combated in transit and marketing by the maintenance for eight days of a temperature of 4·5° C.

ASKEW (H. O.). **A case of combined potassium and boron deficiencies in Grapes.**—*N.Z.J. Sci. Tech.*, A, xxvi, 3, pp. 146–152, 3 figs., 1944.

Chlorosis, followed first by a reddish- and then by a purplish-brown discoloration and collapse, of Albany Surprise vine leaves growing on a poor phase of the Moutere clay-loam soil type at Braeburn, Nelson, New Zealand, was found to be caused by potash deficiency. It was successfully treated during the seasons of 1941–2 and 1942–3 by applications of potassium sulphate at the rate of 4 cwt. per acre. A browning and shrivelling of the flesh of the berries on the same vines was cured by the inclusion of borax (28 lb. per acre) in the fertilizer [*R.A.M.*, xxii, p. 126]. To cite some figures from the chemical analyses, the potash contents of the leaves of vines treated with (1) potassium sulphate and (2) the same plus boron were raised from 0·32 to 0·54 and 0·66 p.p.m., respectively, in 1941–2, the corresponding figures for 1942–3 being from 0·49 to 0·83 and 0·93 p.p.m., respectively. The boron contents of berries receiving (1) boron and (2) the same plus potassium sulphate were increased from 4·4 to 15 and 26·6 p.p.m., respectively, in 1941–2, and from 8·8 to 21·6 and 33·9 p.p.m., respectively, in 1942–3.

MCCUBBIN (W. A.). **Air-borne spores and plant quarantines.**—*Sci. Mon., N.Y.*, lix, 2, pp. 149–152, 1944.

The author discusses and illustrates by theoretical calculations and concrete examples the possibilities of long-distance spread of parasitic fungi by means of air-borne spores [cf. *R.A.M.*, xxiii, p. 310] in relation to the efficiency of plant quarantines in their exclusion from the United States. Of the 200 representative diseases already assembled in connexion with another plant-quarantine study, 75 to 90 per cent. appear to be incapable of more than limited or local dissemination through the air, while even for the few species possessed of the necessary qualifications for transmission over wide areas a series of hazards is involved which greatly reduces the likelihood of success. The value of the quarantine effort remains unimpaired by the remote possibility of intercontinental air-borne spore dissemination, the primary object of the legislative machinery being the prevention of disease and insect introduction from overseas by vigilant attention to the controllable channels of human travel and commerce.

WILLIAMS (P. H.), SHEARD (ENID), READ (W. H.), & SELMAN (I. W.). **Mycological Report.**—*Rep. exp. Res. Sta. Cheshunt, 1943*, pp. 28–52, 4 graphs, 1944.

In this report [cf. *R.A.M.*, xxii, p. 466] P. H. Williams states that cultures of various strains of *Verticillium*, viz., Nos. 19 (reisolation from a tomato of a type culture of *V. dahliae* from Baarn), 24 (reisolation from tomato of V. 243 [loc. cit.]), 25 (reisolation from tomato of a type culture of *V. albo-atrum* from Baarn), and 30, 33, 34, and 36 (cultures isolated from tomato in 1942), fell into two groups. In group 1, consisting of strains 25, 30, and 33, the mycelium was at first white, but later became dark owing to the production of carbonized hyphae and to the brown bases of the conidiophores, while in group 2, comprising strains 19, 24, 34, and 36, definite microsclerotia were formed. The fungi in group 1 are referred to *V. albo-atrum* and those in group 2 to *V. dahliae*. So far 11 strains of the former and four of the latter have been isolated by the writer from tomatoes in England.

The optimum temperature for the development of *V. albo-atrum* was about 25° C. and its maximum temperature slightly over 30°. The corresponding figures for *V. dahliae* were between 25° and 30° and over 30°. It appears likely that an average temperature of 25°, as recommended for the control of *V. albo-atrum*, would have no effect on *V. dahliae* and might even favour infection.

When Ailsa Craig and Riverside tomatoes were inoculated with different strains of *V. dahliae* and *V. albo-atrum*, Riverside was less resistant than Ailsa Craig, but when the experiment was repeated under apparently identical conditions, the

reverse obtained. It is concluded that some control of such factors as temperature and humidity is necessary before reliable results can be obtained by this method.

E. Sheard states that tomato stem rot due to *Didymella lycopersici* became increasingly severe and widespread on glasshouse crops in 1943, particularly in the southern counties. *D. lycopersici* was more virulent when it had overwintered out of doors than when it had been kept at about 59° F.

When tomato seeds were sown in sterilized soil to which cultures of *D. lycopersici* had been added, after four weeks none of the plants showed infection. Seedlings from recently germinated seeds did not become infected when sprayed with a spore suspension of the fungus in water. In another experiment large plants bearing trusses of fruit were more susceptible than plants in the propagatory stages. In practice the disease seldom occurs until the plants are in the borders and carrying one or two trusses. When infected seed was sown in sterilized soil, none of the seedlings showed the disease. The practice of raising healthy plants from infected seed is, however, most undesirable.

In inoculation tests the only plant other than tomato found to be readily susceptible to *D. lycopersici* was eggplant. Wounded stems of *Solanum nigrum* became infected, with resultant death of the plants. Potato haulms inoculated at the beginning of July did not develop infection, but when the plants were inoculated in October, the haulms became infected and died. Wounded haulms were more susceptible than unwounded. A slight infection was obtained on wounded stems of *Nicotiana glutinosa* and tobacco. Experimental evidence indicated that *D. lycopersici* may exist saprophytically on various materials commonly present in nurseries.

The optimum growth temperature for the fungus in pure culture was found to be about 20° C.; it was able to survive short periods at 35°, and was resistant to a temperature of −10°.

W. H. Read found that in most cases of stem rot due to *D. lycopersici* the plants were attacked at the base of the stem, usually immediately above soil-level, but occasionally below, suggesting that the fungus was present either within or on the surface of the soil. The spores may perhaps be carried into glasshouses by air currents, and the attack take place at soil-level because conditions are most suitable there.

Soil sterilization with formaldehyde and a tar acid failed to give adequate control. Base of stem treatments with 0·5 per cent. salicylanilide gave marked reduction in infection, and work in this direction is to be continued.

It was found that spores which had emerged from pycnidia were destroyed when sulphur was burnt at the rate of 1 lb. per 1,000 cu.ft. of glasshouse capacity. Spores within pycnidia on the stems of diseased plants were not killed, however, so that one such fumigation will not completely disinfect the superstructure of a glasshouse, since viable spores will be liberated from diseased stems when the old plants are removed. After removal of old plants, the houses should be sprayed with a 1 in 50 solution of 40 per cent. formaldehyde or a tar acid fluid at the same strength. Where the houses are free from cracks, sulphur can again be burnt at the rate of 1 lb. per 1,000 cu.ft.

P. H. Williams and E. Sheard state that during 1943 a new type of tomato stem rot was observed, caused by *Phytophthora parasitica* [ibid., xxiii, p. 47], and distinguishable from that due to *D. lycopersici* by the folding of the tissues of the outside of the stem, the firmness of the epidermis, and the absence of pycnidia.

Studies by I. W. Selman showed that when Potentate tomato plants at the 8- to 9-leaf stage were planted in pots containing a mixture of stable manure 2 parts, compost 2 parts, and maiden loam 1 part or a mixture of peat 2 parts and loam 3 parts, all the pots receiving the same base fertilizer, and were inoculated a day later in all leaves with the spotted wilt virus, no two plants in either series showed

identical symptoms. In old plants, contamination with tomato mosaic virus was detected. In such cases, the symptoms chiefly resembled mosaic, while in the fruit, ripening appeared to lead to the inactivation of the spotted wilt virus.

In an experiment by Selman made to determine to what extent soil conditions may modify the incidence of blotchy ripening in association with mosaic, it was found that the addition of peat to the soil increased the percentage of blotchy ripening, the increase being highly significant in the mosaic-infected plants and greater in these than in the uninoculated controls. Where mosaic is likely to be widespread, the incorporation of large quantities of peat into the soil may prove highly detrimental to fruit quality. Steaming the soil increased the proportion of blotchy fruit both in the control and, though to a less extent, in the mosaic plants. Compost + stable manure gave the heaviest fruit yields from both the control and the mosaic plants. When a solution of minor elements was watered on to the soil, the amount of blotchy fruit was reduced in the mosaic plants.

It is concluded that one factor influencing blotchy ripening of tomatoes is the type of growth associated with the water-retaining properties of a particular soil mixture. This factor appears to be most favourable for quality fruit production with a soil-stable manure mixture for pot work.

Seventeenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1943.—76 pp., 1944.

This report from Australia [cf. *R.A.M.*, xxii, p. 468] contains, *inter alia*, the following items of interest. The unsatisfactory growth of lucerne and subterranean clover [*Trifolium subterraneum*], widespread on the southern tablelands, is now regarded as due to lime deficiency. In a pot experiment with lucerne, the equivalent of one ton of lime per acre increased the yields upwards of three times, and a response to phosphate resulted only in the presence of lime; response to molybdenum was obtained in the absence, but not in the presence, of lime [see below, p. 105].

In a three-years' test in a field naturally infected with take-all (*Ophiobolus graminis*), continuous cropping with wheat gave 75 per cent. take-all with a very low yield of grain. Bare fallow for two years completely controlled infection and gave the highest yield of all treatments (38 bush. per acre). A wheat-fallow-wheat rotation gave 14 per cent. take-all with 30 bush. per acre. Oats-fallow-wheat gave 3 per cent. take-all and 30 bush. per acre. Wheat after two years' lucerne gave a poor yield, with 13 per cent. take-all. Wheat after two years' Wimmera rye gave an equally poor yield, but with only 3 per cent. take-all. In the wheat-oats-wheat rotation take-all amounted to 10 per cent. and the yield to 25 bush. per acre. Roots from the block fallowed for two years showed no lesions; the severest root injury was in the block continuously cropped to wheat.

The out-of-doors experiments with drums of soil [ibid., xxii, p. 295] were continued, and significant differences were obtained in the numbers of white-headed plants between the drums inoculated with *O. graminis* in 1941 and those not inoculated, the number of whiteheads being greater in the latter. This unexpected response was due chiefly to greater depletion of plant food by the more vigorous growth of the plants in the uninoculated drums during the previous year. Plants growing in soil with adequate amounts of plant food do not readily suffer from take-all. In the current season's experiments very significant differences in severity of root-rotting were noted, and as with whiteheads, the worst occurred in the drums in which a good crop was obtained in the previous year. By adding large amounts of calcium sulphate or burnt lime to the soil root rotting was almost completely eliminated.

The control of internal cork of apples by soil dressings of ½ lb. borax per tree has continued for the seventh year since the application was made. This disorder

is now almost non-existent in Tasmania. Cork of pears and dimple of Granny Smith and Cleopatra apples [ibid., xxi, p. 406] failed to respond to chemical treatments.

Trials of the susceptibility of citrus rootstocks to *Phytophthora citrophthora* [ibid., xxii, p. 133] showed that all lemon and sweet orange types were very susceptible; Seville types were fairly so, and *Poncirus trifoliata* virtually resistant. *P. trifoliata*, especially when budded to Navel oranges, is very inconsistent in its behaviour. Very often the trees are dwarfed in this stock. Selection of *P. trifoliata* types which produce vigorous growth in the scion variety is in progress.

Except for rust [*Melampsora lini*], which caused more than usual loss in Tasmania, the main diseases of flax appear to be physiological in origin. Die-back is associated with waterlogging near flowering time, while browning, which is associated with *Pullularia pullulans* [ibid., xxi, p. 370], is of importance only on some peaty soils. *P. pullulans* can be isolated with equal facility from healthy harvested straws kept moist for about 24 hours. It is one of the commonest retting organisms.

In the development of potato varieties resistant to viruses A, X, Y, and leaf roll, the most promising results have been secured in obtaining crossbred seedlings resistant to Y. Stocks of Up-to-Date potatoes free from virus X resisted drought conditions better than certified stocks of this variety containing virus X.

Much basic work was done in devising sampling methods for estimating and studying the total populations of the aphid vectors of virus diseases in potato crops [ibid., xxiii, p. 273]. This involved measurements of the leaf area of entire plots [ibid., xxiii, p. 73]. A workable rating method was established which gives results accurate to a few per cent. The differences in leaf area of different strains and varieties largely depend on the growth rates of the axillary shoots; in early-maturing types axillary growth is slow and soon stops [ibid., xxiii, p. 496]. The new methods are being applied to such problems as the relative importance of winged and wingless aphids in the transmission of leaf roll in the field. Evidence so far obtained suggests that differences in susceptibility to leaf roll in the commoner Australian potato varieties are a function of the plant tissues and not merely due to preferential feeding by aphids.

It was ascertained that different lots of the same potato variety carried strain mixtures of virus X of the same average severity. Some varieties carried more severe strains than others. Varietal susceptibility appears to determine to a great extent the proportion of strains in the mixtures of virus X normally present in plants and tubers. This has a bearing on the selection and maintenance of seed stocks containing mixtures of virus X consisting predominantly of mild strains and therefore potentially capable of higher yields than ordinary stocks.

The tomato spotted wilt virus was found to be normally a complex of at least three strains, mild, ring spot, and necrotic. The necrotic appears to be identical with the American tip-blight virus [ibid., xxiii, p. 289]. Different combinations of the strains cause widely varying symptoms.

Preliminary work indicated that a very large number of strains of suitable fungi will have to be tested before a strain can be found that will produce a high yield of citric acid. Production from wheat grain was demonstrated by two fermentation processes, saccharification of steamed grain with *Mucor racemosus* followed by acidification with weak sulphuric acid and fermentation with *Aspergillus niger* [cf. ibid., xxiv, p. 67].

Granny Smith apples hand-dipped in an alcoholic solution of 8 per cent. castor oil and 2 per cent. de-waxed shellac (at a cost of about fourpence per case) remained green for five months in the packing-shed [cf. ibid., xxiii, p. 303]. The treatment greatly reduced the incidence of Jonathan spot, lenticel and late scald, breakdown, and bitter pit. The effect of the coatings largely depends on the maturity reached

at picking. Immature treated fruit may develop alcoholic flavours, and over-mature fruit may develop skin disorders; the latter are also more susceptible to mould and calyx rot than the former.

WALLACE (G. B.). **Plant Pathology.**—*ex* Specialist and research work of Department of Agriculture, Tanganyika Territory, 1943, pp. 24–27, [1944]. [Mimeographed.]

In this report [cf. *R.A.M.*, xxiv, p. 8] it is stated that *Sclerotinia sclerotiorum* was observed on French beans for the first time in the Arusha district of Tanganyika Territory in 1942; in 1943 the disease made no appearance, and the previously affected area was planted with maize. In the same year, however, the fungus caused considerable damage to French beans at Oldeani and in the Moshi district.

Alternaria porri was severe on onions and leeks in some localities, while *Puccinia allii* again caused losses to onions and garlic in the Nbubu district. Other new records of vegetable diseases are listed [ibid., xxiii, p. 501].

Cotton leaf spots were conspicuous at Lubaga, accompanied by leaf fall, bud-shedding, and premature splitting of the bolls in cotton strain trials. All strains were affected, particularly 0/53. An *Alternaria* of the *macrospora* group was associated with the disease.

No reports of excessive injury to wheat by *P. graminis* were received. Leaf rust (*P. triticina*) was present everywhere, though without causing much damage, and *Bacterium* [*Xanthomonas*] *translucens* var. *undulosum* was reported as severe on Kenya Governor wheat in the Arusha district. In one locality near Arusha maize infection by *P. maydis* caused a serious set-back and reduction of yield.

Apple pink disease (*Corticium salmonicolor*) was associated with branch die-back. Yellowing of grapefruit leaves responded to zinc sulphate treatment.

WATERS (H. B.). **Report on the Department of Agriculture, Gold Coast, for the year 1943–44.**—10 pp., 1944.

In this report [cf. *R.A.M.*, xxiii, p. 6] it is stated that cacao swollen shoot [ibid., xxiii, p. 254] has continued to spread in the area of the Gold Coast that is chiefly affected, viz., Koforidua, Tafo, Suhum, and Mangoase, and is likely to do so in other parts, including Peki, Wiawso, Nkawkaw, and Konongo. In April and May, 1943, in Kwahu 13,475 trees were cut out, and the compensation paid for apparently healthy contacts removed was £155. 5*s*. 1*d*. In the Kwabeng (South) area the figures were 306 trees and £12. 11*s*. 8*d*. Treatment ceased in May, 1943. A recent survey of the treated patches of the Kwabeng area failed to reveal any fresh attacks round the perimeters.

As a result of a visit by Dr. H. A. Tempany, and after consultation with the Governor and Resident Minister, a comprehensive cacao research scheme on a West African basis was planned with headquarters at Tafo.

NATTRASS (R. M.). **Disinfection of cereal seed.**—*E. Afr. agric. J.*, x, 2, pp. 72–74, 1 fig., 1944.

The author gives a brief popular account of cereal seed disinfection against fungal diseases, and concludes with directions for making an oil-drum mixer.

YABLOKOVA (Mme V. A.). Применение прижизненной и флюоресцентной микроскопии для обнаружения мицелия пыльной головни в прогретом и непрогретом зерне Пшеницы. Сообщение 3-е. [The application of fluorescent microscopy for the detection of live mycelium of *Ustilago tritici* in the heated and non-heated Wheat grain. Third communication.]—*J. bot. U.S.S.R.*, xxix, 2–3, pp. 72–79, 3 figs., 1944. [English summary.]

Of the various methods tested by the author in a study of the effect of moist heat

treatment on the mycelium of *Ustilago tritici* [*R.A.M.*, xxii, p. 425] in wheat seed-grain, different types of staining were found to afford no possibilities of differentiating the cells of the mycelium from those of the host. On the other hand, results obtained by fluorescent-microscopic analysis, involving the examination of sections of infected grains in ultra violet light, showed that the parasite can be distinguished from the host by the brighter and differently coloured fluorescence of the fungus. It was found that the fluorescence of the fungus localized within the germinating wheat grain which had received moist heat treatment was somewhat less bright than that in the untreated grain and duller still, with a change in colour, in grains treated at temperatures slightly higher than the usual (up to 55° C.). The action of the moist heat treatment apparently consisted in weakening rather than killing the mycelium in the grain. Although such damaged mycelium may, under favourable conditions, continue to develop together with the plant tissue for some time, eventually it begins to lag behind and finally perishes altogether.

WINTER (A. G.). **Der Einfluss partieller Sterilisation des Bodens auf die Entwicklung der Laufhyphen von Ophiobolus graminis.** [The influence of partial soil sterilization on the development of the 'runner' hyphae of *Ophiobolus graminis*.]—*Phytopath. Z.*, xiv, 3, pp. 204–302, 9 graphs, 1942. [Received November, 1944.]

Further studies at the Bonn Phytopathological Institute on the influence of partial soil sterilization on the development of 'runner' hyphae in *Ophiobolus graminis* [*R.A.M.*, xxi, p. 11] showed that this process is stimulated by treatment of the soil with heat (50° to 100° C.), chloroform, sulphur dioxide, alcohol, or toluol. No direct connexion could be established between the nutrient content of the soil and the production of 'runners', which derive their food supply from the roots of the host. 'Runner' development may, however, be indirectly affected by the admixture with the soil of organic materials, such as maize meal, glucose, or cut or crushed portions of flowering broad beans, in so far as these modify the natural microflora in a manner favourable or adverse to the requirements of the pathogen.

The incapacity of the fungus to lead a purely saprophytic existence in field soils cannot be attributed to nutrient deficiency, and the promotion of 'runner' growth in partially sterilized soils appears to be due to the elimination of inhibitory factors. The latter can be restored to treated soils by inoculation with small quantities of unsterilized soil containing the antagonistic micro-organisms. It is as yet uncertain whether the destruction of the inhibitory properties is an immediate consequence of partial soil sterilization or follows upon a secondary process of biotic or chemical (? oxidative) disinfection; the latter is believed at any rate to exert an important influence, if not a decisive one.

The 'runner' hyphae react to partial sterilization at a temperature range from 50° to 134° by a growth curve reaching a peak at 70° on loess loam and at 90° to 98° on compost. At relatively high temperatures the combined use of (1) carbon disulphide and (2) heat for partial sterilization is little more beneficial to the 'runners' than heat alone, but at a lower range the two treatments together are more effective than either alone. Where heat precedes carbon disulphide in combination treatments the development of the 'runners' is much poorer than when either method is applied alone.

In general, the two very divergent soil types used in the experiments responded similarly to partial soil sterilization, but their normal inhibitory effects on *O. graminis* evidently rest on their colonization by quite different sets of antagonistic micro-organisms. Thus, it was found impossible to restore the inhibitory properties of compost by an admixture of loess, whereas inoculation with heath humus, which is poor in competitors with *O. graminis*, conferred on the treated compost the

same activity against the fungus as is exercised by unsterilized soil of comparable character. Many complications thus appear likely to attend the biological control of foot rot by means of soil inoculation with antagonistic microflora producing inhibitory substances in other soil types. More hopeful than the introduction of particular micro-organisms into soils poorly equipped with defensive properties is an indirect method of approach, involving the modification of environmental conditions in favour of the antagonists by the addition of organic materials, the fermentative decomposition of which aids the production of substances detrimental to *O. graminis* by the existing microflora. In the field the development of 'runners' may be impeded by an unfavourable hydrogen-ion concentration or defective soil aeration, but such factors are usually subordinate to the inhibitory activities of rival micro-organisms.

GARRETT (S. D.). **Soil conditions and the take-all disease of Wheat. VIII. Further experiments on the survival of Ophiobolus graminis in infected Wheat stubble.**—*Ann. appl. Biol.*, xxxi, 3, pp. 186–191, 1 pl., 1944.

In further experiments on the longevity of *Ophiobolus graminis* [*R.A.M.*, xxi, p. 133] assimilable nitrogen, added to tumblers containing artificially infected wheat straw and either soil or sand, was found to prolong the life of the fungus, especially when used in the form of calcium nitrate. The optimum rate of application for promoting the survival of the fungus on wheat straws in soil was 0·45 gm. nitrogen (per 100 gm. air-dry straw); and in washed quartz sand 0·5 gm. At these rates the percentage of straws containing viable *O. graminis* mycelium was 79 after 28 and 60 after 24 weeks, as against 24 and 13, respectively, in the corresponding control series receiving no nitrogen. Addition of sodium phosphate failed to exert any significant effect on the longevity of the organism. It is suggested that nitrogen prolongs the life of *O. graminis* by enabling it to form new branch hyphae which can explore unexhausted parts of the substratum, while in the absence of available nitrogen the fungus may die of carbohydrate starvation when it has exhausted the zones of enzymic erosion around the hyphae. Support for this hypothesis was gained in a test in which the decline of the fungus was retarded, even if only for a limited period, when infected straws were shaken with some garden soil twice weekly in 3 per cent. dextrose solution. Particulars of technique and detailed results are given of an experiment previously described [ibid., xxiii, p. 59], which indicated that crop plants may be used to compete with *O. graminis* for available nitrogen in the soil.

The results of two small experiments with naturally infected wheat stubble buried in quartz sand confirmed those obtained with the artificially infected straws: examined after three months or eight weeks the percentage of stubble containing viable mycelium of *O. graminis* was 2·2 and 38 in the series receiving 0·5 gm. nitrogen, as against 8 and 15 in the corresponding controls receiving no addition.

MUSKETT (A. E.). **The short wet method of seed disinfection.**—*Ann. appl. Biol.*, xxxi, 3, pp. 218–221, 1 pl., 1944.

When large quantities of cereal seed are sown by hand the use of a seed disinfectant dust, whether poisonous or not, may prove unpleasant, and the author therefore investigated the possibility of using the short wet method of seed disinfection against *Helminthosporium* disease of oats (*H. avenae*) [*R.A.M.*, xvii, p. 809]. The quantity of liquid used was so small that the seed dried out readily after re-sacking without suffering any deleterious effect. The thorough wetting of the seed was achieved by the inclusion of an effective wetting agent. In three small-scale experiments conducted during 1935–37, the short wet method (3·5 per cent. solution of ceresan U. 564, 0·45 gal. per cwt. (40 c.c. per kg.) seed) was proved

to be as effective as dusting with ceresan U.T. 1875A (2 oz. per bush.); Sch. 3330, another soluble organic mercury compound also gave promising results. In large-scale experiments, a small hand-operated machine, the Primus [ibid., x, pp. 374, 445, 650], and a power-driven, the Kontramix [ibid., xx, p. 535], both manufactured in Germany, were used for carrying out the short wet method. The former is capable of dealing with some 38 kg. of seed oats at a time and is of the revolving drum type, the liquid disinfectant being fed into the drum through perforations in an axle; the latter is designed for the continuous treatment and consists of a rotating cylinder feeding the seed at an even and controlled rate into the disinfection chamber into which the disinfectant is atomized in the form of a fine mist. Both machines proved suitable for the short wet method and gave results which compare favourably with those from any other method; the cost of the short wet treatment is also lower than that of the dry. It is recommended that seed disinfected by the short wet method should be sown within three months of its treatment.

SEMENIUK (G.). **Seedling infection of dent Maize by Sclerotium bataticola.**—*Phytopathology*, xxxiv, 9, pp. 838–843, 1 fig., 1944.

Charcoal rot of dent maize (*Sclerotium bataticola*) [*Macrophomina phaseoli*], first observed in Iowa in August, 1941 [*R.A.M.*, xxii, p. 384], was again detected in September, 1943, on some 33 per cent. of the plants in parts of several fields covering a limited area. Its parasitism to maize seedlings, not previously recorded, was established in greenhouse inoculation experiments which resulted in severe mesocotyl and primary root necrosis, accompanied by stunting, though the disease developed only in seedlings raised in soil steamed for five hours at 15 lb. pressure, competition with other micro-organisms, e.g., *Fusarium moniliforme* [*Gibberella zeae*], being reduced to a minimum. The disease assumed a more serious character at 25° to 30° C. than at lower temperatures. The four inbred lines and two single crosses used in the tests varied to some extent in their reactions to the agent of charcoal rot.

YOUNG (P. A.). **Epidemic of charcoal rot of Corn and other crops in east Texas.**—*Plant Dis. Reptr*, xxviii, 29, pp. 898–899, 1944. [Mimeographed.]

The following factors contributed to an epidemic of maize charcoal rot (*Macrophomina phaseoli*) which appreciably reduced the yield of the 1944 crop in east Texas [*R.A.M.*, xxiii, p. 187]: (1) abnormally heavy spring rains packed the soil round the seedlings and delayed growth for a fortnight or up to a month; (2) through the same agency much of the commercial fertilizer applied to the infertile red and sandy soils was leached out; (3) the hot, dry spell from June to August weakened the plants and enhanced their susceptibility to the parasite, which thrives under such conditions. *M. phaseoli* predominates in the lower 18 in. of the stalks, where the epidermis turns grey and often looks black owing to the numerous sclerotia showing through it from the white pith within. Shredding and consequent partial hollowness of the stem bases, followed by lodging of the stalks, are features of the later stages of the disease. Other plants attacked by the pathogen at the Agricultural Experimental Station were tomato, potato, Pinto bean, velvet bean [*Stizolobium deeringianum*], cowpeas, Hubam sweet clover [*Melilotus*], Ogden soy-bean, watermelon, cantaloupe, sorghum, sweet corn, *Crotalaria spectabilis*, and *Cosmos sulphureus*, the beans, cowpeas, sweet clover, and sweet corn being particularly susceptible and showing the above-mentioned grey epidermal discoloration, while cowpea stems harboured the pycnidia of the fungus and sclerotia were detected in the stem bases of *C. sulphureus*, *Crotalaria spectabilis*, tomato, and soy-bean.

BATCHELOR (L. D.) & ROUNDS (M. B.). **Effect of root-stocks on Lemon decline and yield in two experimental orchards.**—*Calif. Citrogr.*, xxix, 9, pp. 242–243, 265–269, 2 figs., 1 graph, 1944.

The symptoms of lemon tree decline disease in California [*R.A.M.*, xxiii, p. 483] are given as follows. At some time during the second decade of the growth of an orchard certain trees may show a tendency to shed their leaves prematurely, those left on the trees turning a yellowish bronze colour, but not necessarily mottled or chlorotic. The small lateral twigs die prematurely and new twig growth does not develop normally; this results in a reduction in yield and in excessive numbers of small 'tree-ripe' fruits. A marked symptom is the dying-back of tree tops which, supplemented by pruning, reduces the top volume of affected trees progressively. The disease symptoms do not usually occur uniformly throughout the orchard and during some seasons certain trees or even whole orchards may show marked improvement, although a relapse may be expected to occur later. It is pointed out that the name 'lemon tree decline', hitherto used rather loosely, may be more properly applied to certain general clinical symptoms than to a specific condition due solely to one cause.

The results of root-stock experiments with the Eureka and Lisbon varieties of lemon, propagated in each case from one single parent tree, confirmed the observations of many other workers that the root-stock is at least one very important factor in lemon tree decline. The disease is apparently specific for lemons. Data collected during at least five annual surveys of the two experimental orchards planted in 1927, one near Riverside and another on the Rancho Sespe, showed that, in the latter, the gradual though somewhat fluctuating increase in the average decline observed from 1938 to 1941 reached its height in May, 1941, following a year of heavy rainfall, when the picking of the fruit was delayed for several weeks after maturity. This delay in harvesting is believed to be responsible for the extremely bad condition of the orchard. The fluctuation in the intensity of the disease from year to year was even more marked in individual trees. Trees on sweet orange root-stocks were strikingly less subject to decline than those on sour orange or rough lemon, those on mandarin orange and grapefruit stocks occupying an intermediate position, with mandarin the more desirable of the two. Trees on Sampson tangelo stocks were even more resistant to decline than those on sweet orange, possibly owing to the fact that the fibre roots of the tangelo [tangerine × pomelo] are more resistant to injury by nitrite and also by *Phytophthora* spp. than are those of other root-stock species. Similar data were collected at Riverside, except that the rough lemon proved much less prone to decline on light soil here than on the clay loam at Sespe, and the Lisbon variety showed somewhat more decline than the Eureka. Strains of the Lisbon lemons are believed to be susceptible to decline in the following descending order: open-type, semi-dense, and short-thorn Lisbon (sometimes erroneously called Villafranca). The yield data showed that in both orchards the best results were obtained with Sampson tangelo, which is apparently equally well adapted to both light and silt loam soils and is considered worthy of trials on a commercial scale.

BARTHOLOMEW (E. T.) & SINCLAIR (W. B.). **Granulation and juice quality in Valencias was affected by insecticides.**—*Calif. Citrogr.*, xxx, 1, pp. 4–5, 1944.

Studies on the effect of oil sprays on granulation in Valencia oranges were carried out from 1939 to 1944 in two groves at the California Citrus Experiment Station, one at Ford-Craig, and the other at Griset. Two plots were fumigated (with hydrocyanic acid at from 18 to 23 c.c. per dose) and the other two sprayed with oil (1½ to 1¾ per cent. concentration). After two or three years, the treatments given were reversed, the plots that had been fumigated being sprayed, and vice versa. In the Ford-Craig grove the results showed in 1940 and 1941 an appreciably

higher percentage of granulated fruits on the sprayed than on the fumigated trees, while the soluble constituents were much lower in the former than in the latter. In 1942 and 1943, after reversal of the treatments, the relative amounts of granulation and juice constituents also became reversed.

In the Griset grove, during the first three years, granulation was much more prevalent and the soluble constituents noticeably lower in the oil-sprayed than in the fumigated plot. Reversal of treatments, however, appeared to have little effect, the relative amounts of granulation and quantities of juice constituents being about the same for each plot in 1942 and 1943, and a possible residual effect of the oil spray must be considered.

As a result of the work the conclusion is reached that the oil spray appeared to increase the amount and severity of granulation regardless of the size of the fruit. Other work by the writers (*J. econ. Ent.*, xxxiv, pp. 821–829, 1941) also demonstrated that oil sprays decreased the soluble constituents of the juice of Valencia and Navel oranges over the figures for fumigated or untreated plots. Hydrocyanic acid appeared to have no effect.

FAWCETT (H. S.). **Psorosis and related virus disorders on Citrus.**—*Calif. Citrogr.*, xxx, 1, pp. 14–15, 1944.

After distinguishing between the types of citrus psorosis known as psorosis A and B, concave gum disease, blind pocket, crinkly leaf, and infectious variegation [*R.A.M.*, xxiii, p. 61], the author points out that prevention depends on taking buds from healthy trees and budding them on to the healthy seedlings [ibid., xxiii, p. 385]. Treatment of trees showing bark symptoms of psorosis A is recommended only for the early stages, before the foliage has deteriorated, and when not too many lesions are present; scraping away the outer bark over and round the lesions may then prolong the usefulness of the tree for 5 to 15 years. No disinfectant need be applied in dry weather. In wet weather, potassium permanganate (1 oz. per pt. water) may be brushed on to the treated areas to prevent entry of fungi. No practical treatment is known for the other forms of psorosis.

BERTELLI (J. C. DE) & BERTELLI (LUCIA K. DE). **Notas fitopatológicas. Podredumbre de los raicillas de los Citros.** [Phytopathological notes. Citrus rootlet rot.]—*Rev. Asoc. Ing. agron.*, xvi, 3, pp. 26–43, 26 figs., 1944. [English summary.]

The form of citrus root rot known as 'tristeza' [*R.A.M.*, xxiii, p. 484] was first observed in Salto, Uruguay, in 1940, reaching Rivera and Montevideo in 1943. In the course of their etiological studies on the disease, the authors found no evidence to support either of the two causes to which it has been attributed, i.e. incompatibility between stock and scion or the absence of certain minor elements from the soil. The nematode *Tylenchus semipenetrans* was found to be capable of inducing symptoms closely resembling those of 'tristeza', but in the former case the diseased trees responded to appropriate manurial treatment by permanent recovery, whereas in the latter they were only temporarily benefited. A species of *Lasiodiplodia* or *Botryodiplodia*, characterized by black, ostiolate pycnidia and chestnut-coloured, oval conidia, 22 to 26 by 12 to 14μ, sometimes furnished with one septum and borne on hyaline, paraphysate conidiophores, was isolated on 2 per cent. potato dextrose and maize agar from the xylem of five trees (three orange and two mandarin on bitter orange stocks) with sunken zones below the point of union between scion and stock. Further experiments are planned to determine the possible connexion of this fungus with the development of root rot, and also to test the theory of its origin in virus infection.

FORBES (A. P. S.). **A common Citrus disease in Nyasaland.**—*Nyasald agric. quart. J.*, iv, 4, pp. 6–8, 1944.

In most parts of Nyasaland, citrus is affected by mottle leaf. Chlorotic leaves

generally occur on the side of the tree exposed to the greatest intensity of light. In mild forms of the condition the yield is reduced, and in severe ones almost negligible, the few fruits that are formed being small and hard. Spraying with a mixture of 10 lb. zinc sulphate (89 per cent. pure) and 5 lb. finely ground hydrated lime per 100 gals. water gave good results in experiments and is recommended, applications being made every two months until the chlorosis has disappeared.

VENKATARAYAN (S. V.). **Spraying of crops against fungoid diseases in Mysore.**—*Mysore agric. J.*, xxi, 4, pp. 123–126, 2 figs., 1943.

The protection of areca palms against koleroga [*Corticium koleroga*: *R.A.M.*, xviii, p. 451] is effected in Mysore by means of two applications of 5–5–25 Bordeaux mixture plus a spreader, such as resin paste or potash-resin soap, at the rate of 2 lb. per 25 gals., one before the rains of the south-west monsoon, towards the end of May or early in June, and the second six weeks to two months later. Other preventive measures should include thorough sanitation of the affected gardens, involving the collection and burning or deep burial of diseased plant refuse; destruction of the various weeds likely to serve as carriers of the pathogen, e.g., *Colocasia antiquorum*, *Bryophyllum calycinum*, *Jatropha curcas*, *Loranthus longiflorus*, and *Ficus hispida*; careful periodical inspections of certain useful trees, *Artocarpus integrifolia* and sandalwood, for instance, which also harbour the koleroga fungus; and the cutting-off and burning of the upper parts of dead areca and coco-nut palms.

PINCKARD (J. A.) & LEONARD (O. A.). **Influence of certain soil amendments on the yield of Cotton affected by the Fusarium-Heterodera complex.**—*J. Amer. Soc. Agron.*, xxxvi, 10, pp. 829–843, 5 figs., 1944.

Neither the total amount of infection nor the distribution of *Fusarium vasinfectum* and *Heterodera marioni* in Ruston and Sarpy sandy loams in Mississippi was influenced by any of the fertilizers [cf. *R.A.M.*, xxiii, p. 225] used in a series of trials covering a period of eight years on the former and three on the latter soil, but the average annual yields were greatly increased and the extent of the injury reduced by most of the amendments, notably stable manure at the rate of 4 tons per acre and upwards and rotted lucerne hay buried in the furrows. It is suggested that unfavourable conditions for cotton root development in the field predispose the plants to infection by *F. vasinfectum*, the incidence of which might be decreased by improvements in the culture of winter legumes and ploughing down the tops, thereby throwing the bulk of the vegetation under the future cotton rows.

RUDOLPH (B. A.) & HARRISON (G. J.). **The unimportance of Cotton seed in the dissemination of Verticillium wilt in California.**—*Phytopathology*, xxxiv, 10, pp. 849–860, 1 fig., 1944.

Cultural studies covering the five-year period from 1934 to the end of 1938 on 3,371 cotton bolls produced on Acala plants severely infected by wilt (*Verticillium albo-atrum*) in California [*R.A.M.*, xi, p. 513; xix, p. 14] showed that the pathogen had reached only 150 receptacles (4·44 per cent.) and penetrated not farther than the bases of the placental columns of two bolls (0·00059 per cent. of the possible seed). None of the 763 seeds from 28 bolls yielded the fungus, which likewise failed to develop from non-sterilized, lint-bearing seed taken from the bottom of the pickers' bags to ascertain the possibility of contamination from infective material as the sacks are dragged along the ground. In another series of tests from 1937 to 1942, 11,723 cultures were made from the minute, black, superficial or erumpent bodies on dead cotton stalks to determine their possible identity with the microsclerotia of *V. albo-atrum*, again with negative results. The organism was shown to die out fairly

rapidly once the tops of the plants have been killed by frost, but it persists in a viable state until the following spring in many of the undecayed tap-roots as well as in the heavier woody portions of the stem at soil-level. Finally, to test a theory that the lint contracts infection at the gins, cotton removed from bolls and steam-sterilized in culture tubes was inoculated with fragments of microsclerotial crusts of the fungus from Czapek's agar (which was used throughout the investigation). The cotton proved to be a poor medium, the growth of *V. albo-atrum* being supported only by lint wet virtually to saturation point, a condition highly unlikely to occur at the gins.

The experimental evidence here presented is considered to demonstrate the extreme improbability of the dissemination of cotton wilt by way of the seed from diseased plants, as well as of the infection or contamination of the lint on healthy seed.

ARNDT (C. H.). **Infection of Cotton seedlings by Colletotrichum gossypii as affected by temperature.**—*Phytopathology*, xxxiv, 10, pp. 861–869, 3 graphs, 1944.

At the South Carolina Agricultural Experiment Station, four lots of 1938 cotton seed (A. Mexican Big Bolt from North Carolina, B. Dixie Triumph from South Carolina, and C. and D. Stoneville 2b from Mississippi and Georgia) infested by *Colletotrichum* [*Glomerella*] *gossypii* and *Fusarium moniliforme* [*Gibberella fujikuroi*] were germinated at 18°, 22°, 25°, 29°, 33°, and 36° C. Anthracnose lesions developed earliest (on the fifth day) at 29° and 33°; the percentages of seedlings outgrowing the symptoms at these two temperatures were 10 and 40, respectively, while at 22° and 25° the disease attained its maximum severity, killing nearly all the infected plants before the 14th day, and the percentage of survivors was under 10 [*R.A.M.*, v, p. 90]. There was little infection by *Glomerella gossypii* at 18° and none at 36°. From 4 to 6 per cent. of the cotyledons were destroyed by a species of *Rhizopus* at 33° and 36°.

The differences among the four lots of seed in respect of mortality percentages were somewhat greater at 22° (5, 10, 12, and 0 for A, B, C, and D, respectively) than at 25° (40, 25, 25, and 0, respectively), the figures at the former temperature indicating the response of the several lots to seed treatment with ethyl mercury phosphate in field plantings.

UPPAL (B. N.), CAPOOR (S. P.), & RAYCHAUDHURI (S. P.). **'Small-leaf' disease of Cotton.**—*Curr. Sci.*, xiii, 11, pp. 284–285, 2 figs., 1944.

'Small leaf' or stenosis of cotton is prevalent in the Provinces of Bombay, Madras, and the Punjab [*R.A.M.*, xv, p. 648], and experiments were carried out at Anand, North Gujerat, and at Poona, to determine the possibility of its transmission by grafting. Rozi (*Gossypium arboreum* var. *typicum* f. *indica*), a highly susceptible perennial variety widely cultivated in the Kaira district of Bombay, was used as the stock, the top being cut off and the stem split down the middle for about an inch to permit the insertion of scions from diseased plants. Some of the tests were successful [number unspecified], as indicated by the typical symptoms of stenosis in the new growth arising from the axillary buds on the previously healthy stocks. Other experiments on American, Jarilla, Gaorani, and Mungari stocks likewise gave positive results. These data are considered to establish the agent of the disease as a graft-transmissible virus, which is apparently not communicable through the sap or seed.

LING (L.). **Factors influencing the development of Cotton diseases.**—*Ann. appl. Biol.*, xxxi, 3, pp. 194–204, 6 graphs, 1944.

Cotton, mainly *Gossypium arboreum* and occasionally *G. hirsutum*, grown in the northern part of the Szechwan Province, China, is stated to suffer most commonly from bacterial blight (*Bacterium* [*Xanthomonas*] *malvacearum*), anthracnose (*Glome-*

rella gossypii), sore shin (*Rhizoctonia* [*Corticium*] *solani*), alternariose (*Alternaria macrospora* and *A. tenuis*) [*R.A.M.*, xx, p. 573], areolate mildew (*Mycosphaerella areola*), and boll rots (*Fusarium moniliforme* [*Gibberella fujikuroi*], *Diplodia gossypina*, and others). Extensive surveys were made during 1938–41 at ten-day intervals throughout the growing season in Suinin to investigate the relation of these diseases to climatic factors. A study of meteorological data (presented in averages or totals of periods of ten days to facilitate comparison between different years) revealed that under local conditions air humidity was more variable between the years than was air temperature or rainfall, and also that it had the greatest influence of the three on the development of nearly all the diseases except the soil-borne sore shin, which is more profoundly influenced by soil moisture and soil temperature. Generally, air humidity, when temperature was not extreme, determined to a large extent the reproduction and longevity of the inoculum, the initiation and intensity of infection, and the survival of the organism, temperature being apparently a subservient factor.

In 1938, relative humidity was low in May but became higher than in all other years from June to the time of picking; accordingly the seedling diseases were unimportant, while diseases of mature plants, including the boll rots, were serious. In 1939, high humidity early in the season encouraged the development of seedling diseases, while most diseases were greatly checked by low humidity later in the season. In the boll stage a very dry condition almost entirely eliminated the boll rots. During this and the preceding, but not the following, two years leaf infection of anthracnose was especially prevalent as a result of high humidity in June, doing little harm to upland cotton but seriously damaging the Asiatic varieties by causing premature falling of leaves and even death of whole plants. In 1940, the humidity in May was the highest of the four years under review, and accordingly seedlings suffered from heavy anthracnose infection. Bacterial blight, on the other hand, was almost negligible. As both diseases are known to be carried over the winter mainly by seed and had been very scarce on cotton bolls in the previous year, it is concluded that the abundance of anthracnose on seedlings points to another mode of survival, probably as a saprophyte. *Alternaria* leaf spot was also highly destructive on seedlings. Unusually dry weather in July, 1940, checked the development of leaf and stem diseases such as bacterial blight, *Alternaria* leaf spot, and anthracnose, but a gradual increase in humidity in late August and September brought about a high incidence of bacterial blight and a severe outbreak of boll rots. In 1941, the humidity was low before the middle of July but rose later, resulting in a gradual increase of bacterial blight late in the season and an outbreak of various boll rots, *Alternaria* leaf spot also appearing later than usually. Sore shin was generally greatly reduced by prolonged dry periods before and after sowing, as in 1938 and 1941. Ordinarily, the disease appeared in May soon after the emergence of seedlings and was checked by the rise of temperature later in the season. In 1940, however, the unusually low soil temperature in May permitted the occurrence of a high percentage of infection as late as early June.

Variation in the time of sowing was found to influence the incidence of diseases of both seedlings and mature cotton plants. In the latter, late sowing appeared to reduce the intensity of bacterial blight and anthracnose. Of the cultural practices tested, nitrogenous fertilizers generally increased the incidence of most diseases; denser stand and closer spacing brought about a heavier infection in stem and leaf but not in boll diseases; and a mixed cropping system had no effect on the fungal and bacterial diseases.

BEARD (R. L.). **Susceptibility of Japanese Beetle larvae to Bacillus popiliiae.**—*J. econ. Ent.*, xxxvii, 5, pp. 702–708, 2 graphs, 1944.

Experimental evidence is adduced to show that the virulence of *Bacillus popilliae*

as an agent of milky disease among Japanese beetle [*Popillia japonica*] larvae [*R.A.M.*, xxii, p. 480] is far less than that of *B. larvae* in the production of foul-brood in honey bees.

MILLIKAN (C. R.). **Phoma stem disease of Flax.**—*J. Aust. Inst. agric. Sci.*, x, 3, pp. 129–130, 1 fig., 1944.

In December, 1942, a small percentage of plants in a mature crop of Concurrent flax growing at Leongatha, Victoria, developed severe stem-spotting somewhat resembling that of the 'pasmo' disease (*Sphaerella linorum*). The spots, which were elongated and dark brown, often with a lighter centre, occurred on any part of the stem, and usually encircled it. In some plants, the upper half of the stem was dead, while in others a sharp bend occurred at the site of the lesion.

Affected areas showed the presence of the subepidermal, dark, spherical pycnidia of a species of *Phoma* measuring 96 to 130 μ in diameter, with a round ostiole measuring 17 to 21 (average 19) μ in diameter. The hyaline, unicellular, elliptical spores ranged from 2·1 to 17·3 by 0·9 to 6·9 (average 6·5 by 2·2) μ. The average measurements are close to those of *P. exigua* [*R.A.M.*, xviii, p. 316], but the range in size is greater. *P. linicola* has on the average larger pycnidia and spores. The species is not identified.

GRANHALL (I.). **Linrosten—en Spånadslinets fiende.** [Flax rust, an enemy of spinning Flax.]—*Lantmannen, Uppsala*, xxviii, 32, pp. 733, 735–736, 1 fig., 1944.

During the last few years severe outbreaks of flax rust (*Melampsora lini*) have been observed in south Halland, Sweden [*R.A.M.*, xviii, p. 679]. In 1944 no differences in varietal reaction to the pathogen were observed, contrary to the experience of previous seasons, when Concurrent suffered heavier damage than Herkules. Reports from Denmark, however, state that Concurrent is less susceptible in that country than the blue-flowered varieties. Precautionary measures against the disease should include the use of thoroughly cleansed seed; crop rotation and the selection of fresh sites at a distance from fields that were under flax the year before; stringent exclusion from the new fields of infected stubble from the preceding harvest; timely sowing and sparing applications of stable manure; and early lifting of a rusted crop to prevent the spread of the fungus.

LAFFERTY (H. A.) & MCKAY (R.). **'Pasmo' disease on wild flax, Linum angustifolium.**—*Nature, Lond.*, cliv, 3918, p. 709, 1944.

During the summer of 1944, flax diseases were very severe in Ireland [Eire]. *Phoma* sp. [*R.A.M.*, xxiii, p. 17] and *Melampsora lini* [ibid., xxiii, pp. 334, 342] were widespread and virulent, the former being particularly troublesome on crops raised from home-saved seed. *Linum angustifolium* from a farm in one of the southern counties showed symptoms closely resembling those of 'pasmo' disease and a fungus agreeing with the published descriptions of *Sphaerella linorum* [ibid., xxiii, pp. 17, 63] was isolated from the affected plants. Cross-inoculations on seedlings of *L. usitatissimum* showed that the fungus readily passed over to ordinary flax. While the disease has not yet been recorded on the last-named host in Ireland, it is probably present on this crop. *Colletotrichum linicola* [ibid., xxiii, p. 17] was also found on *L. angustifolium* and in this case also cross-inoculations showed that the fungus readily passed over to ordinary flax.

HAWKER (LILIAN E.). **Diseases of the Gladiolus. I. Control of hard rot, due to Septoria gladioli Passer., by fungicidal treatment of the corms.**—*Ann. appl. Biol.*, xxxi, 3, pp. 204–210, 1 fig., 1944.

In four years' experiments at the Imperial College of Science Field Station at

Slough, losses from hard rot of gladiolus (*Septoria gladioli*) [*R.A.M.*, xx, p. 468], measured by arbitrary methods of disease- and weight-indexing, were reduced by treating the dehusked corms before planting with various fungicides. Disease index values showed that of the mercury compounds tested, mercuric chloride, aretan, and ceresan were about equally effective, while calomel (mercurous chloride) was less so. In a number of small-scale experiments uspulun did not compare favourably with aretan and was omitted from large-scale trials. The non-mercury compound folosan usually gave less satisfactory results, but the difference was not significant in large-scale trials. The weight index data were in general agreement with these results but ceresan gave a low weight of clean corms produced per old corm planted while folosan gave the highest values. When corms with definite hard-rot lesions were treated, the effect of fungicides as measured by the disease index was much less marked, but the weight index showed improvement after treatment with mercuric chloride and aretan. The addition of hydrochloric acid or a preliminary dip in methylated spirits to facilitate wetting did not increase the efficiency of mercuric chloride (three hours' steep in a 0·1 per cent. solution), while the wetting compound, agral, was definitely harmful to the corms and usually lowered the effect of the fungicide. Reduction in time of steeping to one hour gave promising results. Treatment in November was somewhat more effective than in March. Corms treated with ceresan produced stunted foliage and poor flowers. No other treatment caused any loss of quality, but all the mercury compounds tended to delay flowering, particularly in the presence of agral.

HAWKER (LILIAN E.), BRAY (R. J.), & BURROWS (T. W.). **Diseases of the Gladiolus. II. Experiments on dry rot disease caused by Sclerotinia gladioli Drayt.**—*Ann. appl. Biol.*, xxxi, 3, pp. 211–218, 1 pl., 1944.

The results of inoculation experiments conducted in 1938 and 1939 showed that (1) young gladiolus corms are more susceptible to *Sclerotinia gladioli* [*R.A.M.*, xx, p. 20] than old ones and that they become less susceptible as the growing season advances; (2) unwounded corms are attacked almost as freely as wounded ones; and (3) inoculation of old corms at the top is more effective than at the base or side. The percentage of diseased new corms produced from infected parent corms varied from 0 to 100 according to soil conditions and was highest in wet soil. Dehusking was found to increase the susceptibility of corms planted in contaminated soil but the presence of husks did not provide effective control. Dehusking did not increase the number of infected young corms from an infected stock planted in new soil. None of the varieties tested was immune or strikingly more resistant than the rest. In small- and large-scale control experiments carried out during 1940–43, the most consistently good results were obtained by treating the corms before planting for five minutes in a 1·0 per cent. solution of mercurous chloride, the disease index [see preceding abstract] following the treatment ranging from 0·0 to 7·2 as compared with from 2·2 to 28·5 in the untreated control; good control was also obtained with mercuric chloride (3 hours in a 0·1 per cent. solution) and warm aretan (15 minutes, or later one hour, in a 0·5 per cent. solution); treatment with folosan and cold aretan gave some control but not consistently. Red copper oxide, formalin, and ceresan were harmful. Treatment of contaminated soil with formalin, mercuric chloride, aretan, or uspulun gave good but not complete control, formalin being the least effective.

LYLE (E. W.). **Control of black spot of Roses with sulphur-copper dust.**—*Bull. Tex. agric. Exp. Sta.* 648, 27 pp., 6 figs., 1 graph, 1944.

Premature defoliation of field-grown roses as a result of infection by *Diplocarpon rosae* [*R.A.M.*, xxiii, pp. 63, 90, 114] has been a major problem with commercial rose-growers in eastern Texas. Following several years' field tests, some sulphur-

copper dusts were evolved which gave better control than pure dusting sulphur; the most effective contained about 90 per cent. 325-mesh dusting sulphur and 10 per cent. of an insoluble copper compound such as '34' copper fungicide, copper hydro 40, cuprocide, Dow copper, Grasselli copper, spraycop, copper oxychloride sulphate, and cupro-K. Unconditioned sulphur was as satisfactory as the conditioned product when used with some of the copper compounds and a 93 per cent. 325-mesh sulphur was practically as good as a 98 per cent. for the dust fungicide. Satisfactory control resulted when treatments were begun with the first symptoms and continued at weekly intervals until 1st July, further applications being made within 24 hours after rain, but not more frequently than once a week, for the rest of the season. The most practical dosage was found to be 15 to 25 lb. dust per acre at each application.

With the susceptible Caledonia rose, the treatment not only reduced infection and increased the weight of the bushes, but also greatly increased the percentage of high-grade bushes. Those grading Nos. 1 and 1½ were increased from 52 to 85 per cent. and the net increase in value given by the treatment was estimated at $235 per acre, not including the inferior grades.

It was also ascertained that using resistant understocks delayed infection on the scions. Late removal of the understock tops and pruning back to less than half-an-inch all prematurely formed scions resulted in later development of the scions and subsequent delay in infection. Directing the dust down on to the foliage was at least as effective as projecting it upwards from under the leaves. The benefits of the treatment were also apparent after storage.

GÄUMANN (E.). **Über den Fuchsien-Rost.** [On *Fuchsia* rust.]—*Phytopath. Z.*, xiv, 3, pp. 189–191, 1942. [Received November, 1944.]

Having decided that the uredo stage of a rust attacking *Fuchsia splendens* in Zürich greenhouses must belong either to *Cronartium asclepiadeum* or *Pucciniastrum epilobii*, the author carried out cross-inoculation experiments on peony and *Epilobium roseum*, typical hosts of the former and latter species, respectively. The tests were successful only on *E. roseum*, whence the rust was reinoculated into *F. splendens*, so that *P. epilobii* (Pers.) Otth f.sp. *palustris* Gäum. (*Ber. schweiz. bot. Ges.*, li, pp. 338–343, 1941) is evidently implicated. Since the parasite forms no teleutospores on *F. splendens* and therefore cannot complete its life-cycle on its alternate hosts (*Abies* spp.), it must be reintroduced year by year into the greenhouse from one of the many susceptible species of *Epilobium* growing as weeds or the cultivated *Godetia amoena* and *G. carminea*, on which *P. epilobii* also occurs. One obvious control measure thus consists in the exclusion of these species from the vicinity of the houses, while another lies in the avoidance of the unduly high temperatures favouring profuse infection.

THIRUMALACHAR (M. J.). **Ergot on Cynodon dactylon Pers.**—*Curr. Sci.*, xiii, 11, p. 288, 1 fig., 1944.

Spikelets of *Cynodon dactylon* growing in the vicinity of sugar-cane fields in the Bangalore district of Mysore were observed in the autumn of 1944 to be profusely infected by a species of *Claviceps* closely resembling that collected on sugar-cane in the same locality during the previous year [*R.A.M.*, xxii, p. 315].

DODGE (B. O.). **A new Pseudonectria on Pachysandra.**—*Mycologia*, xxxvi, 5, pp. 532–537, 13 figs., 1944.

The canker disease of *Pachysandra terminalis* [*R.A.M.*, xxiii, p. 489] in the eastern United States is caused by a new species of Ascomycete, *Pseudonectria pachysandricola* n.sp., the conidial stage of which is *Volutella pachysandricola*. The sporodochia reach up to about 400 μ in diameter. The hyaline, unicellular

conidia, which are pointed at the ends, measure 14 to 24 by 2 to 4 μ. In culture on potato dextrose agar the conidia in mass are salmon pink and vary more in size and shape. The faintly coloured, tapering hairs are 100 to 200 μ long and 5 to 10 μ broad at the base, and may appear as soon as the sporodochium ruptures the epidermis. The sporodochia are usually dully amber or ochraceous or (according to R. P. White) russet. From about the first week in June reddish sporodochia may be found; these are becoming stromata, on which perithecia develop.

The young perithecia are roughly granular, owing to the presence of short, coarse, light yellowish to reddish setae projecting from the wall. The dome of the mature perithecium is generally rather smooth. Orange-red to carmine, the perithecia measure 240 to 280 by 200 to 225 μ. The clavate, eight-spored asci measure 60 to 80 by 8 to 10 μ; the hyaline, at first uniseriate, becoming irregularly biseriate, narrowly ellipsoid, unicellular ascospores are 10 to 15 by 3 to 5 μ. Cultures from single ascospores resembled those from single conidia. In general, mixed cultures derived from several spores from the same ascus are more brightly coloured and often rather more vigorous than are cultures from single ascospores or conidia.

The cultural characters and the fact that perithecia so frequently develop directly from old sporodochia functioning as stromata provide further evidence of the connexion between the *Volutella* and the perithecial stage. Living leaves and stems inoculated with conidia from ascospore cultures developed typical *Volutella* sporodochia and conidia.

DODGE (B. O.). **Lawn troubles and their control.**—*J.N.Y. bot. Gdn*, xlv, 537, pp. 208–210, 1944.

The available information on the etiology and control of the fungi destroying lawn grass in the United States is briefly summarized, the diseases listed being brown patch, caused by *Corticium vagum* (*Rhizoctonia solani*) [*C. solani*], dollar spot or small brown patch (*Sclerotinia homoeocarpa*), zonate eye spot (*Curvularia lunata*), spot blight (*Pythium* sp.), pink patch (*Corticium fuciforme*), snow mould (*Calonectria graminicola*), and eastern snow mould (*Typhula itoana*) [*R.A.M.*, xxi, p. 142; xxiii, p. 491]. The most reliable fungicides for lawns are mercuric chloride and mercurous chloride, while highly satisfactory results have also been obtained with organic mercury compounds, such as semesan, nu-green, and barbak, as well as with thiosan. In the case of the snow moulds, particular care should be paid to the choice of resistant grass species, velvet bent [*Agrostis canina*], for instance, being substituted for the very susceptible creeping bent [*A. palustris* or *A. maritima*] and red fescue [*Festuca rubra*].

DILLON WESTON (W. A. R.). **Clover rot.**—*J. Minist. Agric.*, li, 8, pp. 349–350, 1 fig., 1944.

This brief popular account of clover rot (*Sclerotinia trifoliorum*) is, like earlier contributions in this series [*R.A.M.*, xxiii, 434], illustrated by a chart depicting the life-cycle of the fungus.

FRICKE (E. F.). **Molybdenum deficiency. Field experiments at Cressy, Longford, and North Motton.**—*Tasm. J. Agric.*, xv, 3, pp. 65–70, 1 fig., 1944.

On Cressy shaley clay-loam soil in northern Tasmania great difficulty is found in obtaining satisfactory growths of clover and other legumes by ordinary farm methods, though extra cultivation and liming sometimes give good results for a limited period. Pot culture experiments and field trials on pastures and blue pea crops carried out by the author confirmed the presence of molybdenum deficiency [cf. *R.A.M.*, xxii, p. 484]. In both instances it was shown that while the addition of lime induced a satisfactory response, little effect was produced by lime in the

presence of molybdenum, e.g., as ammonium molybdenate in a soluble form, and it is thought that the chief action of the lime may be to bring the molybdenum in the soil into solution. The responses to molybdates on a crop of blue peas at Cressy were profitable for all quantities from 2 oz. to 1 lb. per acre, the most profitable dressing being ½ lb. per acre.

WHITTAKER (E. C.). **Sterilisation of fruit cases.**—*Agric. Gaz. N.S.W.*, lv, 10, pp. 440–441, 2 figs., 1944.

After pointing out that fruit cases in New South Wales are expensive and often difficult to procure, with the result that thousands are being used more than once for marketing fruit, the author cites a description of a steam sterilization plant designed to treat cases in quantity by G. A. H. Helson and W. T. Bennett. It consists of an iron tunnel 14 ft. long fitted with two endless chain belts driven by a ½ h.p. motor, into which live steam at 80 lb. pressure and a temperature of 310° F. is blown, so that a temperature between 170° and 190° is maintained in the tunnel, depending on whether the machine is run continuously or at intervals. This apparatus treats 1,000 cases per hour. The treatment does not damage the cases, washes them clean, removes all rubbish, dries them quickly, and ensures that the fruit is packed in cases free from pests and fungi.

VINCENT (C. L.). **Vegetable and small fruit growing in toxic ex-orchard soils of Central Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 437, 31 pp., 6 figs., 1944.

The large acreage of former orchard lands lying idle at present in central Washington is stated to be unsuitable for the growing of most vegetable or small fruit crops on account of the toxicity of the soil due to an accumulation of water-soluble arsenic from sprays applied to the orchards over a period of 30 to 40 years. Investigations carried out by the Washington Agricultural Experiment Station showed, however, that asparagus, Irish potato, tomato, carrot, tobacco, dewberry, grape, and red raspberry can be grown successfully on arsenic-toxic soil. The growing of rye as a soil-improvement crop aided greatly in reducing the water-soluble arsenic in the soil and increased the yields of tolerant crops, when these followed the growing and ploughing-under of two or more crops of rye.

OBREGÓN BOTERO (R.). **Algunas enfermedades de las plantas en la zona frutera de Boyacá.** [Some plant diseases in the fruit-growing region of Boyacá.]—*Rev. Fac. Agron., Medellin*, v, 19, pp. 594–633, 1942. [Received November, 1944.]

In the course of a visit of inspection to the orchards of Boyacá, Colombia, which have been greatly neglected, the following diseases were observed: apple scab (*Venturia inaequalis*), mildew (*Podosphaera leucotricha*), bitter pit, black rot or canker (*Physalospora malorum* (Berk.) Shear [*P. obtusa*]); peach leaf curl [*Taphrina deformans*], and a trouble of obscure origin (presumably non-parasitic), resulting in the development of unsightly cavities, sometimes filled with gum, on the fruits and causing heavy losses. Notes are given on the diseases and their control.

SMOCK (R. M.). **The physiology of deciduous fruits in storage.**—*Bot. Rev.*, x, 9, pp. 560–598, 1 graph, 1944.

This critical survey of the literature on the physiological processes undergone by stored deciduous fruits, such as apples, pears, peaches, and plums, embodies a number of allusions to the pathological factors involved, reference to which has been made from time to time in this *Review*. The bibliography comprises nearly 200 titles.

ISAAC (W. E.). **The effect of methyl bromide fumigation on Apples.**—*Fmg S. Afr.*, xix, 224, pp. 703–710, 4 figs., 1944.

Treatment of apples against codling moth (*Cydia pomonella*) by methyl bromide fumigation is apt to produce damaging effects, even low concentrations being injurious to Red Delicious apples and very injurious to Granny Smith. Injury may affect the core or the outer parts, or both. When only the skin is involved, the effect often resembles superficial scald [*R.A.M.*, xxii, p. 212], especially frigescence superficial scald [ibid., xxii, p. 29], except that the fumigation injury develops at all storage temperatures, and occurs within a week or two after treatment. Core injury approximates to core flush [ibid., xxii, p. 212], but develops sooner and appears at the calyx end and spreads towards the stem end. In one consignment of Granny Smith apples a third type of injury was observed; the vapour appeared to have passed upwards from the stalk end and out along the vascular bundles round the core. From there the outer flesh was affected. Attention is drawn to the fact that apples that appear sound outwardly may be affected internally.

OSTERWALDER (A.). **Von rollenden Blättern und vom Apfelmehltau.** [Of rolling leaves and of Apple mildew].—*Schweiz. Z. Obst- u. Weinb.*, liii, 15, pp. 268–271, 1944.

Apart from the rolling of apple foliage associated with various physiological factors, such as an excess of sunlight leading to undue respiratory activity, a form of the trouble was prevalent in Swiss orchards during the summer of 1944 on trees attacked by mildew [*Podosphaera leucotricha*]. The brown, necrotic areas on the epidermis are unable to keep pace with the expansion of the growing leaf, hence the contraction and characteristic distortion. Secondary infections by the fungus are not only more virulent than primary ones but also harder to control, partly because they are difficult to detect in the early stages. However, a most trustworthy indication of their presence is afforded by the foliar rolling or local curvature of the margins, often combined with the delicate, white mycelium on the under side and a pale green spotting of the dark green upper surface. The upward-curving leaf margins, moreover, show a reddish tinge on the dorsal surface.

P. leucotricha, which overwinters in the buds, may easily be combated in the early stages by the excision and destruction of the mildewed shoots. On the other hand, it has not proved amenable to treatment with sulphur dust, colloidal sulphur, or lime-sulphur, and is, in fact, owing to the negligence of growers, spreading from the susceptible Boiken variety to Gravenstein, Landsberg Reinette, Beauty of Boskoop, and others.

BOTTOMLEY (A[VERIL] M.). **Peach mildew.**—*Fmg S. Afr.*, xix, 224, pp. 678, 698, 1 fig., 1944.

Peach mildew (*Sphaerotheca pannosa* var. *persicae*), known in the Union of South Africa for a number of years as a minor nursery trouble, has recently become of importance in the orchard. Appearing first in the western Cape Province, where it is said to attack apricots, nectarines, and peaches, the disease is now present in peach and nectarine orchards in the Transvaal. The symptoms on the fruit consist of white to brownish powdery spots which increase in size and number until they cover large areas; young affected fruits often look as if splashed with whitewash. The flesh hardens, the skin turns brownish, and the peach finally cracks. Poor drainage, waterlogging, irrigation, and thick planting are said to favour severity of attack.

Growers in localities where the disease has just appeared should remove early infected shoots and fruits, and treat the trees with sulphur dust, wettable sulphur (5 to 6 lb. in 100 gals. water), or lime-sulphur (1 in 200), all of which appear to

have given good results in the western Cape Province. Spraying should be effected at monthly intervals, beginning as soon as the blossoms drop, while sulphur-dusting probably requires to be carried out at intervals of two or three weeks. A further treatment, consisting of lime-sulphur (1 in 15), should be applied in winter, just as the buds begin to swell.

BERKELEY (G. H.) & CHAMBERLAIN (G. C.). **Diseases of the Raspberry.**—*Fmrs' Bull. Canad. Dep. Agric.* 123 (revised), 11 pp., 3 pl., 1944.

The available information on the virus, fungal, bacterial, and non-parasitic diseases affecting the Canadian raspberry crop is summarized [cf. *R.A.M.*, x, p. 392].

ROSS (A. A.). **Little-leaf in the Custard Apple.**—*Qd agric. J.*, liii, 3, pp. 158–160, 2 figs., 1944.

Custard apple (*Annona cherimolia*) trees in the Sunnybank district of south-eastern Queensland have recently developed the typical symptoms of zinc deficiency (little leaf) on an extensive scale. The disorder, which mainly affects young trees (up to seven years), is characterized, as in the apple, by the cessation of growth on one or more of the leaders and the production of small, mottled leaves, sometimes followed by a gradual die-back of the shoots from the tip to the site of insertion on the trunk. The application of a spray consisting of 10 lb. zinc sulphate and 5 lb. hydrated lime per 100 gals. water twice during the summer growing period restored severely stunted trees to normal health.

DION (W. M.) & LORD (K. A.). **A comparison of the toxicity of certain dyestuffs to the conidia of Fusarium culmorum.**—*Ann. appl. Biol.*, xxxi, 3, pp. 221–231, 5 diags., 1944.

With a view to determining whether any correlation could be found between toxicity and chemical structure of dyestuffs, the author tested the action of a number of them, by the standard slide-germination technique, on spores of *Fusarium culmorum* and *Cercosporella herpotrichoides*. No attempt was made to distinguish between fungistatic and fungicidal activity. It was found that the toxicity of basic dyestuffs was not affected by the acid radicle associated with the dye base. The high toxicity to *F. culmorum* of malachite green dye base was reduced weight for weight and mole for mole by the substitution of ethyl, propyl, or butyl for methyl groups; the toxicity was entirely removed by the reduction to malachite green *leuco*. The substitution of amino and alkylated amino groups in benzene nuclei of triphenyl methane increased toxicity, whereas acid groups lowered it, and sulphonation and carboxylation reduced it to vanishing point. The toxicity was increased by alkylation of amino groups but was not appreciably affected by alkylation of benzene nuclei. The replacement of the central carbon atom of the triphenyl methane dyestuffs by nitrogen (e.g., Bindschedler's green) made these compounds more toxic than the corresponding diphenyl ammonium compounds. The prevention of rotation of the animated benzene rings by bridging, in the *ortho*-position to the central atom, with oxygen or nitrogen, and thus obtaining a planar molecule, had only a slight effect on toxicity. Certain acid dyes were found to stimulate fungal growth. The results are taken to indicate that the toxicity of the basic dyestuffs depends not on one specific part but on the molecule as a whole, and within certain limits the structure may be varied without pronounced changes in toxicity.

VERNE BOWEN (C.). **Organic iodine compounds tested against insects, fungi, and bacteria. A review of the literature.**—20 pp., New York, Iodine Educational Bureau, Inc., [?1944].

This is a list of the organic iodine compounds so far tested against insects, fungi,

and bacteria, with notes on their activity in this respect accompanied by references to the relevant literature. The bibliography comprises 111 titles and there is a list of the patents cited.

CARPENTER (C. W.). **Fusarium disease of the Prickly Pear.**—*Hawaii. Plant. Rec.*, xlviii, 2, pp. 59–63, 3 figs., 1944.

A destructive disease of prickly pear (*Opuntia megacantha*) was observed at Kakaha, Hawaii, in November, 1943, characterized by a progressive softening of the whole 'pad' or cladode, which became grey to fuscous, collapsed, and fell. Sometimes, much exudate oozed from the ruptured surface and dried as a firm gum, secondary bacteria hastening the destruction with the formation of gas which caused the affected part to swell.

A *Fusarium* and two strains of bacteria were isolated from affected material. When healthy pads were inoculated with the three organisms, alone and in every combination, typical rot developed only when the *Fusarium* was present in the inoculum. In a later test, inoculations of detached pads with the fungus gave 100 per cent. positive results. Numerous inoculations of 12 prickly pear plants growing in the open were made hypodermically with spore suspensions of pure cultures of the reisolated *Fusarium*. In ten days the fungus had infected the pads at every inoculation point. In most cases, the inoculated pads rotted and dropped in three weeks, while smaller inoculated plants were rotted to the ground.

The fungus was identified as a variety [unspecified] of *F. oxysporum* with an odour characteristic of several species of the section *Elegans*; the macroconidia measured 35 to 55 by 4 to 5 μ.

In the more fertile sections of the Hawaiian islands the prickly pear is looked upon as a detested weed which renders large areas of the best land useless. In such localities any disease of this host would be welcomed.

GUBA (E. F.) & SEELER (E. V.). **Studies on the identity and control of stilbaceous mold in gas purifying sponge.**—7 pp., 5 figs., American Gas Association, 1944. [Mimeographed.]

In July, 1943, the authors' attention was directed to a fungal infection of the gas-purifying sponge used at the Everett, Massachusetts, plant of the Boston Consolidated Gas Company. In some boxes the growth partly obstructed the flow of gas. The fungus was characterized by dark, cylindrical bundles of hyphae with dark conidial heads and by fertile, creeping, branching hyphae sporulating at the extremities. Short conidiophores with a single apical conidium arising laterally along the hyphae were also noted. The conidia were one-celled, ovate to oblong to long piriform. The organism was identified by D. H. Linder as *Sporocybe borzinii* Goidànich [*R.A.M.*, xvii, p. 559] (= *Petriella lindforsii* Curzi).

Temperatures of 180° F. for one minute or 150° for 15 minutes intimately applied to the fungus were ascertained to be lethal after proper distribution of the heat, while growth was completely inhibited by an initial highly alkaline reserve in the sponge and the maintenance of alkalinity above P_H10. Control methods suggested consist in the injection of steam into the sponge and purification structure and its confinement long enough to obtain a uniform lethal temperature, or in the injection or diffusion of formaldehyde into the boxes by steam siphon, or by the action of potassium permanganate. Wetting down the top layer of sponge with formaldehyde 1 in 50 or with a 0·2 solution of santobrite (sodium pentachlorophenate 85 per cent.) is also suggested. Sterilization of the wood shavings or ready-made sponge with heat or chemicals is desirable.

CASS SMITH (W. P.). **Some aspects of plant pathology in Western Australia.**—*J. Aust. Inst. agric. Sci.*, x, 3, pp. 93–101, 1944.

In this presidential address, delivered before the Western Australia branch of

the Australian Institute of Agricultural Science on 23rd June, 1944, the author briefly reviews the efforts made to cope with plant diseases in Western Australia from about the middle of the nineteenth century until to-day, discusses the contributions made to agricultural progress by plant pathology in the State during the past 33 years, and indicates the scope and nature of the work at present being carried out.

MORROW (MARIE B.) & RACHANER (M. GERMAINE). **Fungus slide cultures: new methods.**—*Trans. Tex. Acad. Sci., 1943*, xxvii, pp. 114–116, 1944.

Distinctive features of the slide culture technique for mould study developed at the Department of Botany and Bacteriology, University of Texas, include the dispersal of the inoculum in 1 per cent. glycerine water; the spreading of the medium (Waksman's agar) in a ribbon-like streak or so as to form a roughly circular area several mm. in diameter; the incubation of the prepared slide, placed agar side upwards crosswise over another slide in a 'moist chamber' consisting of a Petri dish with a few drops of sterile water in the bottom; and the use of lactophenol [*R.A.M.*, ix, p. 260] as a combined fixing-staining-mounting medium. Some growth should become apparent after 24 hours, but the development of fructifications may require a period of up to 72 hours, or even a week in the exceptional case of *Chaetomium*.

CAVALLITO (C. J.) & BAILEY (J. H.). **Preliminary note on the inactivation of antibiotics.**—*Science*, N.S., c, 2600, p. 390, 1944.

The authors isolated from *Allium sativum* an antibiotic active against Gram-positive and Gram-negative organisms and rapidly inactivated by cysteine. Other antibiotics of thallophyte and spermatophyte origin were tested in the presence of cysteine, and in every case complete inactivation or marked reduction in antibiotic activity resulted. Gram-positive antibiotic activity was more susceptible to cysteine inactivation than Gram-positive activity.

The inactivation observed is regarded as unusual in the light of the widely different chemical types of antibiotics concerned. In those substances where the nature of the reaction of cysteine is known, cysteine reacts irreversibly with the antibiotics. The suggestion is made that perhaps the fundamental mode of action of certain classes of antibiotics involves their ability to interfere with the normal function of sulfhydryl groups in bacterial metabolism.

SHWARTZMAN (G.). **Enhanced production of penicillin in fluid medium containing cellophane.**—*Science*, N.S., c, 2600, pp. 390–392, 2 graphs, 1944.

When cellophane bags of suitable surface were added to fluid culture media the growth of the submerged and surface penicillin-producing strains of *Penicillium notatum* became faster and more abundant, and penicillin appeared earlier and reached higher concentrations in larger total volumes than in the control cultures without cellophane. Enhancement also occurred under conditions unfavourable for penicillin development, i.e., (*a*) with degenerated cultures, and (*b*) when the surface penicillin-producing strain was grown in cultures with an unfavourably small surface area/total volume ratio (0·0315). In addition, the cellophane exercised a conspicuously stabilizing effect upon the H-ion concentration of abundantly growing cultures during the active production of penicillin. This stabilization has significance, as the sharp rise in P_H value usually noted in *Penicillium* cultures tends to the rapid destruction of the penicillin.

It is stated in a footnote that in later experiments an even greater and faster production of penicillin was obtained by the use of cellophane strips instead of bags.

BURKHOLDER (P. R.), EVANS (A. W.), MCVEIGH (ILDA), & THORNTON (HELEN K.). **Antibiotic activity of lichens.**—*Proc. nat. Acad. Sci., Wash.*, xxx, 9, pp. 250–255, 1 fig., 1944.

When the anti-bacterial activity of the extracts from 42 species of lichens was determined by means of the cup plate procedure, it was found that 27 species were active against *Bacillus subtilis* or *Staphylococcus aureus*, four against *Proteus vulgaris* or *Alcaligenes faecalis*, but none against *Escherichia* [*Bacterium*] *coli*.

STANLEY (N. F.). **Aspergillin, a stable antibacterial substance of high potency produced by a species of Aspergillus.**—*Aust. J. Sci.*, vi, 5, pp. 151–152, 1944.

Preliminary investigations on the composition of aspergillin, a crystalline compound isolated from the metabolic fluid of a strain of *Aspergillus* grown for five days at 24° C. on Czapek-Dox agar by Hobby *et al.* (*Proc. Soc. exp. Biol., N.Y.*, l, p. 277, 1942) indicate the presence of carbon, hydrogen, oxygen, and sulphur. Gram-positive organisms are much more susceptible to its action than those of the Gram-negative group. In the writer's experiments the bacteriostatic titres range from 1 in 160,000 for *Salmonella typhi* to 1 in 40,960,000 for *C*[*orynebacterium*] *diphtheriae gravis*. The strongest aqueous solutions obtained were non-toxic to laboratory animals and leucocytes. The anti-bacterial property of aspergillin is not neutralized by serum, peptone, or yeast extract, or destroyed by boiling at any P_H between 1·5 and 8.

TATUM (E. L.). **Biochemistry of fungi.**—*Annu. Rev. Biochem.*, xiii, pp. 667–704, 1944.

In his review of recent contributions to the knowledge of fungal biochemistry, comprising 333 titles, the author endeavours to correlate new developments in this subject with the general concept that genetic controls, similar to those operating in the case of *Neurospora*, are responsible for many of the varied biochemical activities of fungi. The thesis is expounded under the following headings: vitamin and growth-factor requirements, vitamins and respiratory functions, genetic basis of growth-factor and vitamin requirements, genetic control of other biochemical reactions, sexual phases and biochemical reactions, induction of mutations or variants in fungi, symbiosis and related problems, biosynthesis of vitamins, growth factors, and amino acids, adaptation and changes in synthetic capacity, inhibitions, cultural specificity and cultural conditions affecting mould products, nature and action of antibiotic agents from fungi, interrelationships of mould products, and miscellaneous.

RAYNER (M[ABEL] C.) & NEILSON-JONES (W.). **Problems in tree nutrition.**—184 pp., 27 pl., 1 diag., 10 graphs, London, Faber & Faber Ltd., 1944. 12*s.* 6*d.*

The subtitle of this book, to which a foreword is contributed by H. M. Steven, Department of Forestry, University of Aberdeen, describes it as 'an account of researches concerned primarily with the mycorrhizal habit in relation to forestry and with some biological aspects of soil fertility'. Of the six chapters, Nos. II to V were published as a series of papers in *Forestry* at intervals between 1934 and 1941 [*R.A.M.*, xiv, p. 410; xv, 737; xix, p. 36; xxi, p. 298], and VI in *J. agric. Sci.*, in the latter year. Each chapter is followed by a summary, and a bibliography of 58 titles and a glossary are appended.

HÖFLER (K.). **Über Kalkchlorose und Calciose im Jahre 1941 und W. S. Iljins biochemische Untersuchungen.** [On lime-induced chlorosis and calciosis in the year 1941 and W. S. Iljin's biochemical investigations.]—*Phytopath. Z.* xiv, 3, pp. 192–203, 1942. [Received November, 1944.]

Among the plants affected by an exceptionally severe form of 'lime-induced

chlorosis' in the environs of Vienna in 1941 were vine, apple, pear, quince, *Robinia [pseudacacia]*, ash, tree of heaven [*Ailanthus glandulosa*], wild rose, elder, privet, Dutchman's pipe [*Aristolochia sipho*], *Cornus mas*, and *C. sanguinea*, and in this connexion a full account is given of W. S. Iljin's biochemical studies on the disturbance (*Jb. wiss. Bot.*, xc, p. 464, 1942) [cf. also *R.A.M.*, xxiii, p. 374], together with references to the work of Schander on juvenile chlorosis in lupins [ibid., xviii, p. 530] and other relevant investigations.

Discussing the name 'lime-induced chlorosis', the writer points out that it is strictly applicable only to the later stages of the trouble, and not to the earlier phases, in which the chlorophyll content of the leaves is still undiminished, though chemical changes have already taken place in the tissues, notably the accumulation of citric acid. The term 'chlorosis', moreover, was first used by Gris in France in 1843 to describe a condition due to iron deficiency, for which it ought, on grounds of priority, to be still reserved. In view of its widespread usage in phytopathology such a course would now be impracticable, but it is at any rate misleading to designate as 'chlorotic' foliage in which no sign of yellowing or bleaching is apparent. The name of 'calciosis' is therefore proposed to express the symptoms of deranged metabolism in plants of a calcifuge habit on calcareous and dolomitic soils.

Schultz (E. S.), Bonde (R.), & Raleigh (W. P.). **Early harvesting of healthy seed Potatoes for the control of Potato diseases in Maine.**—*Bull. Me agric. Exp. Sta.* 427, 19 pp., 1944.

Evidence is presented demonstrating the benefits obtained in the control of seed potato virus diseases in Maine by early harvesting before the viruses have had time to reach the tubers.

In 1935, an experiment was started to determine the extent to which different strains of seed potatoes could be maintained in a virus-free condition by roguing the seed plot and early harvesting. One strain of Triumph and two of Green Mountain were used, the seed plot being 200 to 1,000 ft. from commercial fields. It was planted as early in the season as possible with early-harvested potatoes selected from the seed plot the previous season. During the last week in June and each week in July the diseased plants discovered were removed. The tops in the seed plots were pulled by hand before aphids appeared. Hills were dug and kept separate, and the following year planted as hill units. If any plant in a hill unit showed disease, the whole unit was discarded.

The data obtained with the Triumph variety showed that although it is very difficult to produce healthy Triumph seed potatoes locally, disease-free seed was produced in six of the eight years the experiment lasted. In 1936, only 0·5 per cent. mosaic was present, and in 1937 only 2·9 per cent. In both years, a few aphids were found in the seed plot at harvesting and in 1937 a severely diseased field was located only 200 ft. away. In 1940 and 1941 tubers were harvested late. Those harvested on 20th September, 1940, had 48 per cent. severe mosaic and 65 per cent. leaf roll, while those harvested on 24th September, 1941, had no mosaic, but 44 per cent. leaf roll.

Data obtained with a Vermont strain of Green Mountain propagated from 1935 to 1943 showed that early harvesting (the earliest date ranging from 25th July to 7th August) prevented virus spread in six years and restricted it considerably in the other three. Thus, in 1936, only 0·2 per cent. of the early-harvested seed stock had mild mosaic; in 1937, 0·5 of that harvested on 7th August had mild mosaic, and 0·8 per cent. had leaf roll. In 1940, 1 per cent. of the stock harvested on 31st July showed mosaic. No disease was present in the stock harvested as late as 13th August, 1939, 16th August, 1942, or 28th August, 1943. There was little or no disease in samples harvested by the first week of August; disease increased as

the season advanced; and by late August and during September stocks were in most cases badly infected.

When the tests were extended to farms in eight different localities, in all cases early harvesting materially reduced the amount of disease. In no instance did early harvested seed potatoes show over 1·6 per cent virus disease.

Ring spot [*Corynebacterium sepedonicum*] was not found. Growers are warned not to harvest seed plots while the foliage is green if late blight [*Phytophthora infestans*] is present. Potato tops were successfully killed by spraying with a solution of sinox (2 gals.) and ammonium sulphate (10 lb.) per 100 gals. water or with 'handy killer' (sodium arsenite), 4 pints per 100 gals. water. Treating freshly dug tubers with formaldehyde solution (1 pint in 30 gals.) or Bordeaux mixture (3–3–100) greatly reduces tuber decay by *P. infestans*.

If growers would practise early harvesting it is probable that ring rot would be eliminated and virus diseases controlled, so that epidemic outbreaks of the latter would at least be greatly reduced.

SCHULTZ (E. S.) & BONDE (R.). **The effect of latent mosaic (virus X) on yield of Potatoes in Maine.**—*Amer. Potato J.*, xxi, 10, pp. 278–283, 1944.

Field studies conducted in Maine in 1939 showed that latent mosaic caused by potato virus X is harboured more generally than any other virus disease by most of the old and some of the new potato varieties, causing typical mosaic symptoms in some and no symptoms at all in others. The strains of the virus varied in their severity, the stronger strains producing more severe foliage symptoms and causing greater losses in yield than the weak strain. Latent mosaic was found to be responsible for 9 to 22 per cent. reduction in yield, representing annual losses of millions of bushels. Virus X in combination with other viruses affects the potato even more adversely than when alone. Thus, mild mosaic caused by potato viruses A+X reduced the yield by about 25 per cent. For control of latent mosaic it is advisable to grow healthy seed potatoes in isolated fields, as susceptible varieties contract the disease by contact with the foliage of infected plants. From ten years' experience with Green Mountain potatoes infected with weak virus X, which failed to contract the common strain of the virus although grown in alternate rows with plants carrying it, and from several years' tests with Chippewa potatoes showing a similar behaviour, it is concluded that serious losses can probably be prevented by protective inoculation of very susceptible varieties with the weak strain of the virus. Another method of control lies in the direction of breeding varieties immune from virus X, as immunity was found to persist in progenies of virus X-immune parents.

SCHAAL (L. A.). **Variation and physiologic specialization in the common scab fungus (Actinomyces scabies).**—*J. agric. Res.*, lxix, 5, pp. 169–186, 1 col pl., 6 figs., 3 graphs, 1944.

In studies started at the Aroostook Farm, Maine, and continued at the Plant Industry Station, Maryland, and at the University Farm, Minnesota, single-cell cultures of *Actinomyces scabies* [*R.A.M.*, xxiii, p. 331], obtained from potatoes grown on various soil types in different States, were found to differ in colour of mycelium and of pigment produced on the modified potato dextrose agar. The isolates were unstable and produced variants which differed from the parents and from each other. Most colonies sectored freely, but one variant did not sector at all during three months' observation. The average size of mycelial cells varied, but was in no isolate greater than 2·5 μ in length. Some isolates produced spirals while others did not. Aerial mycelium grew most rapidly and produced the greater number of sectors on a medium containing thiamine, but was inhibited by media

with high nitrogen content. On potato dextrose agar four isolates grew somewhat better at 20° to 24° C. than at 18°, and the size of sectors, which were produced at all temperatures, was smaller at the lower temperature. Of the ten isolates grown on the same medium adjusted to P_H 5 to 8·5, five had made very little growth after 60 days at P_H 5; sectors were produced at all P_H values except 5. When a number of isolates was tested on three commercial and five seedling varieties of potatoes they were found to differ in pathogenicity, but no definite correlation could be detected between pathogenicity and cultural or other characteristics. Variants appeared to differ from their parent cultures in pathogenicity. Certain strains caused russetting in normally smooth-skinned varieties.

BEARE (J. A.). **Potato scab and seed piece decay. Control by seed treatment.**—*J. Agric. S. Aust.*, xlviii, 1, pp. 12–13, 1 fig., 1944.

In trials against potato scab [*Actinomyces scabies*] and seed-piece decay conducted in 1944 in South Australia the treatments used were (1) dipping the tubers in a new proprietary organic mercurial compound at 2 oz. per 10 gals. water before cutting, (2) and (3) at 4 and 8 oz., respectively, per 10 gals. before cutting, (4) and (5) at 2 and 4 oz., respectively, per 10 gals. after cutting, (6) undipped, tubers cut immediately before planting, (7) dipping in zinc oxide 5 lb. per 10 gals. after cutting [*R.A.M.*, xxii, p. 370], (8) undipped, tubers cut one week before planting, and (9) dipping in 2 oz. mercurial dip and 5 lb. zinc oxide per 10 gals. after cutting. Except in treatment (8), all the tubers were cut, treated, and planted on the same day.

Germination was excellent, and none of the dip treatments appeared to injure the young shoots or cut surfaces. The percentages of scab (slight plus moderate) were, respectively, 4·2, 0·6, 0·3, 2·5, 3, 25·8, 1·4, 30, and 0·5. Treatments (6) and (8), which were not dipped, differ significantly from the others, but the remaining differences are not significant. The mercurial compound was effective at all strengths and is recommended for use at 2 to 4 oz. per 10 gals. The zinc oxide was as effective as the mercurial. The commercially significant scab in plots from untreated seed was approximately 10 per cent., representing a loss of 1 ton per acre.

HARTMAN (R. E.) & AKELEY (R. V.). **Potato wart in America.**—*Amer. Potato J.*, xxi, 10, pp. 283–288, 1944.

The spread of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xxiii, p. 276] in the United States is stated to have been controlled by temperature and moisture relationships, by the use of immune varieties, and by strict regulations applied to the importation of foreign potatoes as well as those governing the growing of potatoes in the infested area. So far no new biotypes of the fungus, such as have been discovered recently in Europe [ibid., xxiii, p. 405], had been observed in the United States, but there is no assurance that new forms, which are more virulent and have a wider range of adaptation, will not be found.

In tests conducted in Pennsylvania from 1933 to 1943, 14 new American potato varieties and the Dutch variety President were tested for wart resistance. Katahdin, Mohawk, Sequoia, Mesaba, and Norkota proved to be immune, and Houma very resistant; all six have Katahdin as their male parent. The varieties Chippewa, Sebago, Golden, Erie, Earlaine, President, Earlaine 2, Potomac, and Warba were susceptible. In a total of 117 seedlings from 14 crosses and two selfed lines, segregation for resistance occurred in ten lines, seven of which had Katahdin for a parent. Two selfed lines of that variety showed, after grouping, about 50 per cent. of their seedlings to be very resistant. Of the 60 other seedling varieties of value as parents and commercial sorts tested, 11 were found to be immune, four very resistant, and 45 susceptible.

WAGER (V. A.). **Dusting Potatoes for late blight.**—*Fmg S. Afr.*, xix, 224, pp. 681–687, 1944.

In many parts of South Africa, 1942, 1943, and the early part of 1944 were very wet, with the result that *Phytophthora infestans* increased in intensity until nearly every patch of potatoes became attacked, the disease occurring in many localities where it had never been seen before. Early in 1944 it swept through vast areas of the Orange Free State, where most of South Africa's table potatoes are produced, and almost completely destroyed the crops. In previous years, attacks have been mainly confined to certain areas, such as George and Knysna in the Cape, the midlands of Natal, and the mist-mountains at Haenertzberg, Transvaal, infection elsewhere being sporadic.

Experimental treatments with copper-lime dust carried out from 1942 to 1944 in various parts of the Natal midlands, using a hand duster and 50 to 80 lb. dust per acre, according to the number of applications, in all cases gave increases in yield, which in some instances reached 40 to 60 bags (1 bag = 150 lb.) per acre. As the cost of the dusting was only about £2 per acre (plus labour), this represented a considerable financial gain.

MCCALLAN (S. E. A.) & CHAN (S. Y.). **Inducing sporulation of Alternaria solani in culture.**—*Contr. Boyce Thompson Inst.*, xiii, 7, pp. 323–335, 1 fig., 2 graphs, 1944.

A further study of the factors influencing spore production by *Alternaria solani* in culture [cf. *R.A.M.*, xxiii, p. 139] showed that undisturbed cultures of most isolates produced few or no spores, potato dextrose agar cultures scraped and placed on a window-sill sporulated more or less readily, and that other media or the addition of vitamin B components, in conjunction with scraping and exposure on a window-sill, were without effect or no better than potato dextrose agar.

Maximum vegetative growth and sporulation on scraped cultures occurred at 20° C., but at the optimum temperature sporulation tended to increase with decrease in relative humidity. Even, however, with optimum temperature and humidity, sporulation did not equal that of the controls on the window-sill.

Cultures exposed to an open mercury arc lamp gave, under favourable conditions, 10,000,000 spores per Petri dish culture. Scraped cultures produced a maximum of spores after about 20 seconds' exposure, whereas unscraped cultures required longer, and produced less than one-sixth as many spores. Scraping before or after irradiation made no significant difference in the spore yield. Maximum yields were obtained at 10 cm. distance from the lamp and with cultures two weeks old. After scraping and irradiation there was a pronounced optimum at 20° for greatest sporulation.

Irradiation through coloured glass filters strongly affected sporulation, which increased as the wave-length transmitted decreased. The greatest sporulation resulted with filters whose lower limits of transmission ranged from 249 to 254 mμ. The spores from irradiated cultures were as infective as those from cultures exposed on the window-sill.

It is concluded that maximum sporulation by *A. solani* (Maine strain 52) is induced by growing on potato dextrose agar for two weeks at 20°, scraping, exposing to ultra-violet irradiation for 20 seconds with lamps or filters transmitting to about 250 mμ, and returning to incubation at 20° for two days.

ROSE (D. H.) & SCHOMER (H. A.). **Relation of heat and desiccation to bacterial soft rot of Potatoes.**—*Amer. Potato J.*, xxi, 6, pp. 149–161, 2 figs., 1 graph, 1944.

Symptoms of heat injury, such as are commonly observed in the field on potatoes harvested in warm or hot weather, were experimentally induced in freshly dug potatoes by exposing the tubers to the rays of infra-red lamps emitting a heat energy approximately equal to that of sunlight on an average clear summer day.

The symptoms, a blackening of the skin and of the underlying flesh and oozing of lenticels in the darkened area, appeared after about two or three hours' exposure, when the temperature of the potato tissue (at tuber surface) rose to 135° to 140° F. or higher, although in a few instances injury was noted at 125° to 127°. Measured by small thermocouples half-an-hour after the start of the experiment, the surface of the potatoes was found to be about 16° warmer than the air 1 in. above it; and after two hours and 20 minutes 32° (or in another test 42°) warmer, indicating an accumulation of heat in the potatoes far in excess of the temperature of the surrounding air. This leads to the conclusion that heat injury may occur in freshly dug potatoes when air temperatures are not excessively high, a view supported by observations made in the field in Virginia in 1938 and in Nebraska in 1942. Maturity appeared to have no effect on susceptibility to heat injury, but freshly dug potatoes were much more susceptible than those that had been held in dry air in the laboratory for two or three days.

In experiments with skinned and unskinned potatoes exposed to infra-red light, air and tissue temperatures at the skinned places (each 1 sq. in. in area) were in all cases lower, sometimes much lower, than those on the surface of unbroken skin. In one extreme instance, the differences between skinned and unskinned areas at the end of the experiment were 15° at the surface, 18·6° just under the surface, and 21·7° $\frac{1}{16}$ in. above the surface. These differences are explained by the absorption of heat through evaporation of moisture from the skinned surface. This evaporation is stated to be so rapid that it can cause noticeable sinking or pitting of the flesh in 15 mins.

When, following exposure to infra-red lamps, potatoes were placed in moist chambers at 90°, all unsterilized lots developed typical bacterial soft rot (*Erwinia carotovora* and *E. aroideae*) [*R.A.M.*, xx, p. 489] after 24 hours, while those which had been previously disinfected with mercuric chloride developed no decay after a week, indicating that heat injury and bacterial soft rot (the symptoms of which are often considered to be characteristic of sun scald) are two distinct phenomena and that the rot follows the injury only when bacteria are present and conditions are favourable for their growth. It is pointed out, however, that under field conditions bacteria are commonly present. The development of bacterial soft rot in transit depends largely on transit temperatures, provided that, prior to shipment, the potatoes have been subjected to conditions predisposing them to the rot. It is evident that potatoes which have been promptly handled at harvesting are less likely to develop transit decay than those that have lain in the sun for several hours before being picked up.

The browning and subsequent shrivelling of skinned potatoes exposed to dry air either during harvest or in transit is stated to be a more frequent cause of loss than bacterial soft rot, because, unlike the rot, it can develop at moderate temperatures (60° to 70° or even lower). Occasionally the skinned areas turn almost black and sticky with bacterial or mould growth of a type different from bacterial soft rot. All the commercial varieties observed were susceptible to browning, the most resistant being Sebago which, apparently for this reason, is replacing the susceptible Katahdin in some of the large producing regions of the South. As an exposure of skinned potatoes to drying winds in the field for as little as 15 to 30 minutes had at times resulted in browning and stickiness and a considerable lowering in the commercial value of a shipment, the prompt picking-up of potatoes after digging, advocated above against bacterial soft rot, is also recommended for the prevention of this disorder.

KNORR (L. C.). **Efficacy of the rotary knife in the control of Potato ring rot.**—*Amer. Potato J.*, xxi, 9, pp. 250–261, 1944.

In both of two factorial experiments on the control of potato ring rot (*Coryne-*

bacterium sepedonicum) [*R.A.M.*, xxiii, p. 147] by means of the rotary cutting knife, two mercuric chloride cut seed dips, and ultra-violet light, the rotary knife gave the highest yields of healthy and total tubers. It also significantly reduced the amount of affected tubers. In both tests, the mercuric chloride gave the best control of ring-rot spread, but it produced the smallest crop of healthy and total tubers. A high correlation was obtained between stand and yield, indicating that the yield of total tubers (healthy and diseased) depended on the effect of any particular treatment upon emergence.

HANSFORD (C. G.). **A probable virus disease of Sweet Potato.**—*E. Afr. agric. J.*, x, 2, pp. 126–127, 1944.

In March, 1944, sweet potatoes growing at Kawanda were found to be affected by a disease which was subsequently ascertained to be probably widely distributed in Uganda, to occur in Ruanda-Urundi and the adjoining areas of Tanganyika Territory, and to be present, apparently, to a serious extent in the district west of Lake Albert, in the Belgian Congo, where the crop has had to be virtually abandoned as a food supply for the Kilo Mines. The disease is thus potentially of serious importance in those parts of East Africa where the sweet potato is a major source of food supply. Both in the Belgian Congo and at Kawanda, white flies (Aleyrodidae) have been found in large numbers in affected plots, and are suspected to be the vectors.

The symptoms vary widely with the host variety. Some narrow-leaved varieties show severe stunting; the field has a yellow-green appearance, and individual plants grow very slowly, have small leaves, and show an excessive branching of the vines, with short internodes. The leaves generally display an indefinite mosaic of light and dark green areas or, in other varieties, a light yellowish-green banding along the veins. Older leaves frequently present bronzing of the entire leaf or of indefinite, scattered parts of the lamina. Enations were not observed. Broad-leaved varieties reveal more variation in leaf symptoms and reaction to infection. The Six Week variety shows almost complete infection, with pronounced mottling or mosaic of the leaves but little or no dwarfing; older leaves are slightly bronzed. Other broad-leaved varieties show mottling or mosaic or veinbanding, in some with distortion of the leaf shape, in others with leaf-crumpling, while parts of the leaf may be distinctly thick and tough. Most varieties show bronzing of the older leaves. On varieties which normally develop a red or purple pigment in the leaves and stems the symptoms are extremely obscure, particularly when dwarfing is absent.

Control resolves itself into the development of a resistant variety. Surveys should be made to determine the distribution of the disease and precautions should be taken to prevent its introduction into new areas.

PRESLEY (J. T.). **A disease of Guayule caused by Sclerotium bataticola.**—*Plant Dis. Reptr*, xxviii, 30, p. 936, 1944. [Mimeographed.]

Sclerotium bataticola [*Macrophomina phaseoli*] was responsible for heavy losses in two-year-old dry-land guayule [*Parthenium argentatum*] plantings in south Texas during July and August, 1944. In a field spacing experiment, in which the plants were set at three distances apart, 6·6 per cent. of those in the 40 in. rows were diseased on 31st July and 10·3 per cent. on 22nd August, the corresponding figures for 20 and 10 in. being 3·8 and 8·9 and 2·2 and 6·5 per cent., respectively.

EATON (F. M.). **Deficiency, toxicity, and accumulation of boron in plants.**—*J. agric. Res.*, lxix, 6, pp. 237–277, 2 col. pl., 2 figs., 3 graphs, 1944.

In experiments carried out at Riverside, California, from 1930 to 1934, to obtain comparative data on the symptoms, growth reactions, and boron accumulation

characteristics of different plants, 50 species (58 varieties) of plants were grown in each of six large outdoor sand cultures supplied, respectively, with 0·03 to 0·04, 1, 5, 10, 15, and 25 p.p.m. of boron.

Approximately 25 per cent. of the plants made best growth in the trace-boron culture, while others responded to 1 p.p.m. or more. The growth of some species was increased by 10 and 15 p.p.m. Twenty varieties showed morphological symptoms of boron deficiency in the trace-boron culture, and the maturity of four varieties was markedly affected at this level. The evidence indicated that there is much overlapping between the injurious and beneficial effects of boron within plants, mild to marked leaf injury occurring in 19 of the 72 plants at or below the substrate concentrations that gave the best growth.

The boron concentrations (dry-weight basis) in leaves of plants growing in 5 p.p.m. of boron ranged from 58 to 1,804 p.p.m. and in 25 p.p.m. of boron from 209 to 3,875 p.p.m. Concentrations in roots, stems, and fruit were generally much lower than in the leaves, while in entire plants they averaged about half that in the leaves. Numerical values for tolerance ranged from under 10 to over 200 p.p.m. Ratios of boron concentration in leaves to boron in the trace-boron nutrient were mostly between 400 and 1,200, and in 1 p.p.m. of boron between 50 and 200. Lower ratios were found when the boron concentrations of the substrates were higher.

In a number of plants, boron deficiency was most marked under climatic conditions that restricted the movement of boron from the leaves to the other tissues. Apparently, factors affecting the movement and distribution of boron in the plant may be almost as important in determining boron requirements as the boron-supplying ability of the substrate.

SHANOR (L.). **Additional records of aquatic Phycomycetes isolated from Mexican soils.**—*J. Wash. Acad. Sci.*, xxxiv, 10, pp. 330–333, 1944.

An annotated list is presented of 14 species of aquatic Phycomycetes isolated from Mexican soils, including *Achlya flagellata*, *Pythium debaryanum*, and *P. graminicola*.

SKINNER (C. E.) & MELLEM (ETHEL M.). **Further experiments to determine the organisms responsible for decomposition of cellulose in soils.**—*Ecology*, xxv, 3, pp. 360–365, 1944.

When finely divided filter paper was added to acid soils 60 per cent. saturated with water there was no evidence of activity by cellulose-decomposing bacteria, in the presence or absence of nitrates, though mould growth increased considerably. In soils whose initial P_H value was over 5 both moulds and cellulose-decomposing bacteria showed a significant increase. The conclusion of R. J. Dubos that both aerobic bacteria and moulds take part in the decomposition of cellulose in non-saturated soils unless they are distinctly acid [*R.A.M.*, vii, p. 472] is substantiated.

MAGIE (R. O.). **Disease and insect control on Hops.**—*Bull. N.Y. St. agric. Exp. Sta.* 708, 20 pp., 4 figs., 1944.

A tabulated account is given of seven years' experiments (1937–43) in Oneida County, New York, to determine the most effective and economical methods of combating hop downy and powdery mildews (*Pseudoperonospora humuli* and *Sphaerotheca humuli*) [*R.A.M.*, xxi, p. 246; xxii, p. 40], sooty mould (*Cladosporium aphidis* Thuem. or a closely related species), and insect pests.

The best control of the two mildews on late varieties was secured by four applications of Bordeaux mixture 6-4-100 plus 4 or 5 lb. wettable sulphur dust, two treatments being given in June and two in July at 15- to 20-day intervals.

Red or yellow cuprocide and zinc sulphate-lime sprays at metallic concentrations of 1½–100 also gave very satisfactory results except as regards the protection of the cones against *P. humuli*. Copper-sulphur dusts, though not so reliable as Bordeaux mixture, are a useful adjunct to the latter when a serious outbreak of one of the mildews necessitates rapid action, or for early-season applications, when the ground may be too wet to support the weight of a spraying-machine. The dusts, moreover, may safely be used on the cones as a substitute for the Bordeaux-sulphur spray, which leaves an unsightly residue. In the case of early varieties, spraying should be begun about a week and concluded a fortnight earlier than on late ones.

Sooty mould and the associated aphid (*Phorodendron humuli*) on late varieties proved amenable to two applications of nicotine sulphate (1 in 800 or 1 in 1,200), the first coinciding with the last Bordeaux-sulphur treatment and the second (to which should be added 1½ lb. laundry soap and ¼ lb. washing soda or 3 lb. potash fish oil soap per 100 gals.) just before harvest. The latter is seldom required on early varieties.

Sanitation was an important factor in the elimination of downy mildew in certain valley yards where early and rapid development of the disease is the rule. The removal and destruction of infected basal shoots during May and early June, before the sporulation of the fungus, retarded the appearance of severe symptoms by over a fortnight. Other preventive measures should include stripping the plant bases of extraneous growth, timely training of the young vines in an upward direction, the burning of mildewed debris as soon as the crop has been picked, and the eradication of 'wild' hops in the vicinity of the gardens.

CRANDALL (B. S.) & DAVIS (W. C.). **Cephaleuros virescens on Cinchona in Central and South America.**—*Plant Dis. Reptr*, xxviii, 30, p. 926, 1944. [Mimeographed.]

The algal leaf spot caused by *Cephaleuros virescens* [*C. mycoidea*] has been observed on the Ledger variety of *Cinchona officinalis* and on *C. succirubra* in Guatemala, the former species also being attacked in Peru, while *C. pubescens* is infected in Colombia. The disease appears to be of no economic importance, but *Cinchona* may be noted as a new host for the alga.

CRANDALL (B. S.) & DAVIS (W. C.). **Occurrence of Cinchona root rots in the Americas.**—*Plant Dis. Reptr*, xxviii, 30, pp. 926–929, 1944. [Mimeographed.]

Investigations are in progress on the root rots of *Cinchona* in the Western Hemisphere, where little or no work has hitherto been accomplished on the diseases of this crop, interest in the cultivation of which is increasing at the present juncture. Two unidentified root rots have been reported by Kevorkian from Puerto Rico (*Rep. P. R. agric. Exp. Sta., 1941*, pp. 9–10, 1942), one of which is characterized by symptoms resembling those of the 'grey root fungus' (*Rosellinia* sp.) described by A. Rant from Java (*Bull. Jard. bot. Buitenz.*, Ser. ii, 22, 22 pp., 1916). In the Western Hemisphere, *Cinchona* 'root and collar rot' comprises a complex of diseases in which species of *Phytophthora* would appear, from the external manifestations, to be largely represented. In the incipient stages of the disease the decayed tissues are chestnut-brown. Among the leaf symptoms associated with this disease group are a reduction in foliar density, very slight epinasty, increased reddening, and occasional dwarfing, while gradual defoliation accompanies the final phase.

In existing Guatemalan plantations, *C. succirubra*, commonly used as a stock for the Ledger variety of *C. officinalis*, appears to be generally resistant to endemic root rots, but it sometimes serves as a conductor of the agent of at least one such disease. Affected trees may be recognized by their sparse, reddish, somewhat

stunted leaves. The root-stocks of 14 out of 15 four- to eight-year-old trees suffering from this disorder showed a very narrow streak, often not exceeding 1 mm. in width, of infected cambial tissue extending between a root lesion and the graft union, while the Ledger scion bore a girdling canker connected through the union with the rotted streak in the root-stock. Some of the cankers reached a maximum distance of 3 ft. up the trunk before encircling it just above the graft union. Ledger trees on their own roots were also attacked by this presumably soil-borne parasite.

In Peru the mortality from root rot in a ten-year-old planting amounted to about 20 per cent. The infection evidently originates in the underground collar region and proceeds through the cambium for 8 to 10 in. above soil-level before girdling and killing the tree. The fungus responsible for this type of root rot appears to be quite virulent, having destroyed as many as three replants in some parts of the plantation. Both here and in Guatemala certain individuals seem to possess an inherent resistance to the diseases attacking them which promises well for the selection of stocks likely to withstand infection. Chemical analysis of the bark of the affected Peruvian trees showed that the quinine content approaches its maximum concentration at about the seventh year. Since most of the losses from root rot occur after this age, trees with even a moderate capacity for resistance might be grown to maturity on an economic basis.

Several plantings of the Calisaya variety of *C. officialis* on the eastern slopes of the Andes in the Department of La Paz, Bolivia, have been entirely destroyed by a root rot. The introduction of fragments of the diseased roots into unripe wild pineapples yielded cultures of a fungus with the hyphal characters of a *Phytophthora*. The inspection of four separate areas clearly pointed to faulty field practices as a contributory factor in the loss of the plants, which were placed in the bottom of holes 1½ ft. deep and 5 to 6 in. in diameter, where they became submerged during the rainy season, while the roots were unable to make normal growth in the impermeable subsoil.

WALKER (E. A.). **Diseases observed on Wormseed in Maryland.**—*Plant Dis. Reptr*, xxviii, 28, pp. 883–884, 1944. [Mimeographed.]

Wormseed (*Chenopodium anthelminticum*), widely grown in Carroll County, northern Maryland, for medicinal purposes, was observed in the course of a survey of 125 acres on 5th August, 1944, to be affected by wilt (*Fusarium semitectum* var. *majus*) and leaf spot (*Cercospora anthelmintica*), the maximum incidence of the former being 2 per cent. and of the latter 1·5.

EDGERTON (C. W.) & CARVAJAL (F.). **Host-parasite relations in red rot of Sugar Cane.**—*Phytopathology*, xxxiv, 9, pp. 827–837, 6 figs., 1944.

A study at the Louisiana Agricultural Experiment Stations of some host-parasite relationships in sugar-cane red rot (*Physalospora tucumanensis*) [*R.A.M.*, xxiii, p. 358] showed a typical internal lesion to consist of a white to straw-coloured centre with a red surrounding zone. In advance of the mycelium, the host cell protoplasm exudes a gummy material that fills the intercellular spaces, while at the same time a reddish pigment is produced and absorbed by the cell walls. The red zone constitutes a barrier to the progress of the invading mycelium and develops more rapidly in resistant varieties, such as Co. 281, than in susceptible ones. In cut stalks kept under warm, dry conditions the cells, no longer functioning normally, permit the unrestricted spread of the mycelium. In the stalk and leaf mycelial penetration is effected through the pits in the cell walls. Infection hyphae from appressoria were detected in the epidermal cell walls of the leaf sheath. Subcuticular acervuli develop from mycelium filling the epidermal and subepidermal layers, which sends minute hyphae through the epidermal cell walls;

these hyphae, after passing the cell wall, immediately begin to produce conidiophores and setae between the wall and the cuticle, which is pushed up until it finally ruptures.

BAIN (D. C.). **The use of abrasives for inoculating Sugar-Cane seedlings with the mosaic virus.**—*Phytopathology*, xxxiv, 9, pp. 844–845, 1944.

Very encouraging results were obtained in inoculation experiments on two-month-old sugar-cane seedlings of the cross Co. 281 × U.S. 1694 at the Sugar Plant Field Station, Houma, Louisiana, with the mosaic virus by means of sand or carborundum [*R.A.M.*, xv, p. 737 *et passim*]. Four weeks after the operation, 44 and 42 per cent. of the seedlings abraded with sand and carborundum, respectively, showed mosaic symptoms, compared with 13 per cent. of those inoculated by means of Matz's needle-prick method [ibid., xii, p. 660]. The latter technique, though usually 90 per cent. or more effective with susceptible varieties, is unduly laborious for the large-scale experimental work, involving the annual inoculation of 15,000 to 25,000 new seedlings, carried on at the Station.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1943.—41 pp., [? 1944].

In this report [cf. *R.A.M.*, xxii, p. 78] it is stated that sugar-cane mosaic is of paramount commercial importance in Jamaica, but of comparatively small commercial importance in Trinidad and the Windward and Leeward Islands.

In experiments on the artificial transmission of the disease a modification of the Sein method was used. A long strip of diseased leaf was cut, doubled in half, placed round the central unrolled leaf spindle of the healthy plant, and held between the thumb and forefinger of the left hand. The leaf was rolled tightly between the thumb and forefinger and then pinched, after which inoculation was effected in the usual manner, with a bunch of No. 000 insect pins thrust through a cork and projecting about $\frac{3}{8}$ in. Preliminary tests having demonstrated the satisfactory nature of this technique, inoculations of a large number of seedling crosses were carried out. From the results [which are tabulated] it is as yet too early to draw any conclusions, but the work is being continued.

GADD (C. H.). **Report of the Mycologist for 1943.**—*Bull. Tea Res. Inst. Ceylon* 25, pp. 24–31, [? 1944].

Poria hypolateritia [*R.A.M.*, xx, p. 137] still appears to be the commonest root disease of tea in Ceylon. No death has occurred since 1937 in plots treated in that year by the removal of every affected bush, with a ring of apparently healthy ones [ibid., xvi, p. 634]. Evidence from a plot from which only obviously diseased bushes were removed in 1937, 1939, 1941, and 1943 indicates that losses will exceed the number of bushes that would have been removed had a complete ring of apparently healthy bushes been uprooted at the first treatment. Once a plot has been thoroughly treated, supplies may at once be planted without the use of a test plant.

Although weather conditions appeared exceptionally favourable for infection by *Cercosporella theae* [ibid., xviii, p. 821], only two cases were reported. The most serious injury occurred in a 'gum' nursery at an elevation of 5,500 to 6,000 ft., where about 6,000 young plants were killed; infection appeared to have originated in the leaves of old gum trees in the vicinity.

Possibly owing to abnormal weather, *Marasmius equicrinis* [ibid., viii, p. 340] was more prevalent than usual on low-country estates. It gives tea-bushes an untidy appearance, but causes no ill effect. The conditions favouring it, however, also favour other fungi, some of which are parasitic, and particularly noticeable damage due to infection by another fungus may easily be attributed to the blight.

Empty bagworm cases (species unidentified) bearing numerous short lengths of the mycelium of *M. equicrinis* were received from a low-country estate.

In a report contributed by T. E. T. BOND it is stated that phloem necrosis [ibid., xxiii, p. 362] in the St. Coombs observation plots increased annually from 1939 to 1943 to 37·2 per cent. (average annual increase 5 per cent.) in the plots (677 bushes) and 14·0 (2·3) per cent. in the single rows (1,134 bushes). These figures are cumulative values for necrotic and suspected bushes together, and indicate the potential rather than the actual severity of the disease, many of the bushes remaining in average production for many years. The difference in rate of spread accords with expectation, the plots having been put down in relatively severely affected areas and the rows selected more or less at random for the survey. A plot of about 300 bushes on the Uva side, under observation since 1940, showed 11·2 per cent. increase in 1940 and 23·8 per cent. in 1943, representing an average annual increase of 4·2 per cent.

Observations confirmed the patchiness of the disease and strongly suggested that spread is both discontinuous, to bushes remote from the nearest infection centre, and continuous, i.e. from bush to bush. Rate of spread as determined in field plots will thus vary according to the size and position of the plot and the length of time the disease has been present therein. The figures for St. Coombs and Uva indicate a doubling in the percentage increase every three years or so, and this is believed to be fairly representative of necrotic areas at under 5,000 ft. elevation. At higher altitudes, the period of doubling may be under one year.

Experimental evidence demonstrated conclusively that complete roguing every six months reduced the potential rate of spread by at least two-thirds, while partial roguing was effective to some extent. Under field conditions, roguing is uneconomic, and the bushes believed to be necrotic should be removed only if they are regarded as non-productive, i.e., if the space occupied would be better filled by a healthy supply. The result does, however, confirm the existence of bush-to-bush spread, and demonstrates its relative importance as compared with random dispersal.

PRUTHI (H. S.) & SAMUEL (C. K.). **Entomological investigations on the leaf-curl disease of Tobacco in northern India. V. Biology and population of the white-fly vector [Bemisia tabaci (Gen.)] in relation to the incidence of the disease.**—*Indian J. agric. Sci.*, xii, 1, pp. 35–57, 1 pl., 5 graphs, 1942.

The biology of the white fly, *Bemisia tabaci*, the vector of tobacco leaf-curl [*R.A.M.*, xix, p. 584; xxii, p. 197], was the subject of a five-year study at Pusa. A complete list of the alternate food plants of the insect is given, together with the times of year of its visits to them and its intensity. Many of these plants show symptoms closely resembling those of tobacco leaf-curl, and in the case of tomato, *Solanum nigrum*, *Crotalaria juncea*, *Ageratum conyzoides*, *Launia asplenifolia*, *Vernonia cinerea*, *Zinnia elegans*, *Sida rhombifolia*, *Euphorbia hirta*, and *Scoparia dulcis*, the same virus was shown to be concerned. The incidence of the disease in tobacco depends on the white-fly population, which reaches a maximum in the autumn, falls in the winter, and mounts again in March.

TERNOVSKY (M. F.). Методика селекции невосприимчивых сортов Табака к табачной мозаике и мучнистой росе. [Methods of breeding Tobacco varieties resistant to Tobacco mosaic and powdery mildew.]—*Всесоюзн. научноиссл. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ).* [*The A. I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (VITIM)], Krasnodar, *Publ.* 143, pp. 126–141, 1941. [Received December, 1944. English summary.]

The author outlines the methods of preparing the virus solution for artificial

infection, the mode and time of infection, and the manner of calculating the data used in his breeding work with hybrids of *Nicotiana glutinosa* and *N. tomentosiformis*, which showed a promising degree of resistance to tobacco mosaic and powdery mildew [*Erysiphe cichoracearum*: *R.A.M.*, xx, p. 89].

CLAYTON (E. E.), SHAW (K. J.), SMITH (T. E.), GAINES (J. G.), & GRAHAM (T. W.). **Tobacco disease control by crop rotation.**—*Phytopathology*, xxxiv, 10, pp. 870–883, 1 fig., 4 graphs, 1944.

The authors' conclusions as to the value of crop rotation in the control of tobacco bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), stem rot (*Sclerotium rolfsii*), and *Fusarium* wilt (*F. oxysporum* var. *nicotianae*), have already been summarized from another source [*R.A.M.*, xxiii, p. 460].

LOJKIN (MARY E.) & BEALE (HELEN P.). **A colorimetric method for the quantitative determination of minute amounts of Tobacco-mosaic virus and for the differentiation between some of its strains.**—*Contr. Boyce Thompson Inst.*, xiii, 7, pp. 337–354, 1 fig., 5 graphs, 1944.

The authors describe, with full technical details, a method of quantitative determination of minute quantities of tobacco mosaic virus by means of the Klett-Summerson photo-electric colorimeter, using the Folin phenol reagent (Folin *et al.*; *J. biol. Chem.*, xii, pp. 239–243, 1912; lxxiii, pp. 627–650, 1927), known to produce a characteristic blue colour in the presence of tyrosine and tryptophane. As little as 0·006 to 0·600 mg. of virus is needed for a determination. It is possible by this method to differentiate between those strains of the virus which differ in their tyrosine and tryptophane content.

KOTTE (W.). **Die Wildfeuerkrankheit des Tabaks in Deutschland.** [The Tobacco wildfire disease in Germany.]—*Acta nicotiana*, pp. 401–404, Berlin, Verl. R. Gahl. [Undated. Abs. in *Ernähr. Pfl.*, xxxix, 3–4, p. 24, 1943.]

Tobacco wildfire [*Pseudomonas tabacum*] has been recognized in Germany since 1923, but the first virulent and widespread epidemic in the south-west dates from 1927 [*R.A.M.*, vii, p. 547]. At the moment the writer rates it as by far the most important disease of the crop, especially in seasons marked by a period of cold, wet weather shortly after planting out and a recurrence of similar conditions at the end of July to early August. Steam-sterilization of the seed-bed is an effective precautionary measure which is gradually winning favour in Germany, though the practice is attended by some difficulties incidental to the prevailing system of cultivation in smallholdings; it is, moreover, not free from various disadvantages, such as the intensified infestation of steamed soils by certain pathogens [cf. ibid., xxiv, p. 71]. The best direct control of the disease in the seed-bed is afforded by the application of copper-containing sprays or dusts to the young plants, which may be continued, in conjunction with rational cultural methods, as a preventive in the field, where the question of direct control, however, no longer arises.

SIMONDS (A. O.) & KREUTZER (W. A.). **Infection phenomena in Tomato-fruit rot caused by Phytophthora capsici.**—*Phytopathology*, xxxiv, 9, pp. 813–817, 2 figs., 1944.

In a histological study at the Colorado Agricultural Experiment Station on the initial invasion of tomatoes by *Phytophthora capsici* [*R.A.M.*, xx, pp. 44, 336, 501] and subsequent development of the fungus in the host tissues, green fruits of the Landreth variety were inoculated with zoospore suspensions prepared by a specially devised method [see next abstract] and incubated for periods of two to 72 hours in moist chambers 25° C. Sections 12 to 20 μ thick from the infected

material were killed and fixed in formalin-acetic-formalin solutions recommended by Bass [ibid., xx, p. 218], of which 'Graf' I and II gave the best results.

By two to three hours after zoospore germination large numbers of appressoria had been produced and given rise to invasion hyphae, which penetrated the cuticle, sometimes entering the epidermal cells directly, while in other cases they grew tangentially as far as the junction of two cells, whence radial ingress was effected. The latter mode of invasion, observed mostly in fruits beginning to turn pink, was apparently associated with the development of resistance in the cutinized wall. The distension of the outer tangential walls of the epidermal cells by the accumulation of underlying hyphae led to the rupture both of cells and cuticle and the emergence of hyphal masses through these channels. On inoculated fruits incubated for 72 hours the emergent hyphal agglomerations were macroscopically visible as mycelial mats, which were similarly observed on naturally infected material kept for 48 or 72 hours in moist chambers at 25°. Sporangia were plainly discernible in the smaller external hyphal growths.

Infection of tomato fruits by *P. capsici* took place more rapidly through the stylar than by way of the stem end. In general, tomatoes inoculated through the stylar end contracted infection in 70 to 90 minutes in 98 per cent. of the tests, whereas even after eight days' incubation there was frequently no evidence of the typical watery breakdown at the stem end, where it was replaced by small, sunken, rust-coloured, arrested lesions.

The comparative examination of sections from the stylar and stem ends of Landreth and Nebraska tomatoes revealed no essential differences in structure, apart from a thicker cuticle on the epidermal cells of the former, but the stem end cells contained three distinct types of crystals and small, non-plastid, globular masses which were absent from the stylar-end tissues. The three forms of crystals were (1) prismatic and apparently of the monoclinic or hexagonal system, (2) cubical in cross section and often elongated, and (3) raphide clusters. The failure of the invasion hyphae to spread through the subepidermal tissues of the stem-end suggests a connexion between the presence of the crystals or some accompanying chemical substance and the arrested-lesion type of infection. In fact, a correlation exists between the presence or absence of the crystals, whatever their nature, and the resistance or susceptibility of the fruit tissues tested [cf. ibid., xv, p. 453]. In stained sections of the rust-coloured spots there was a deposit of reddish-brown gum in the epidermal and subepidermal cells, the latter often being completely disorganized.

KREUTZER (W. A.) & BRYANT (L. R.). **A method of producing an epiphytotic of Tomato fruit rot in the field.**—*Phytopathology*, xxxiv, 9, pp. 845–847, 1944.

The method devised for the laboratory inoculation of tomato fruits with *Phytophthora capsici* [see preceding abstract] involved the culture of the fungus at 25° C. on steamed barley in Erlenmeyer flasks for 20 to 60 days, after which the contents of each flask were passed through a food grinder and incorporated into the upper 3 in. of unsteamed field soil in a wooden flat. The soil was thoroughly watered, loosely covered with paper to prevent excessive transpiration, and turned with a trowel once or twice daily for aeration. By the end of 24 to 48 hours sporangia had developed in profusion, and after a further one to three hours samples of 1 cu. in. of the soil mixture in 30 ml. tap water were found to contain an abundance of zoospores, which caused rapid infection of the fruits at 25°.

For large-scale use 110 cultures of *P. capsici* grown for 60 days in 1-qt. milk bottles were ground and mixed with 1½ cu. yds. soil in a large wooden frame adjoining the trial field. The soil was duly aerated and moistened, and daily from the third to the eighth day a shovelful was placed in several 4-gal. glazed earthenware jars containing 1 gal. ditch water, drops of which, examined at half-hourly

intervals for three hours, were found to be filled with zoospores 1½ to 2½ hours after exposure at 75° to 85° F.

The prepared inoculum was spread thinly at the bases of the plants during irrigation, and shovelfuls were also placed at the edges of the running water at 25-yd. intervals in the furrows. An overhead sprinkler supplemented the furrow system of irrigation for the first three days after irrigation. The new method resulted in the uniform infection of tomato fruits in the whole of the field plots, bearing some 2,500 and 600 plants in 1942 and 1943, respectively.

ROBERTS (F. M.). **Factors influencing infection of the Tomato by Verticillium albo-atrum. II.**—*Ann. appl. Biol.*, xxxi, 3, pp. 191–193, 1944.

In continued studies on the *Verticillium albo-atrum* disease of tomato [*R.A.M.*, xxiii, p. 154], Kondine Red seedlings transplanted into 8-in. pots containing glasshouse compost or allotment loam were inoculated, when 10 to 12 in. high and developing the first flower bud, by settling the potted plants firmly in saucers in which a culture of the fungus was distributed between two layers of soil. Nutrient solutions were applied twice, one day after inoculation and again two days later, and contained the following amounts per plant: 1·325 gm. nitrogen (as sodium nitrate), 0·185 gm. phosphate (as sodium dihydrogen phosphate), and five doses of potash (as potassium sulphate) ranging between 0 and 3·232 gm. In the five potash tests, 15 or 16 out of 20 plants (or 77 per cent.) became consistently infected, indicating that, at least when the supply of nitrogen and phosphate is sufficient for good growth of tomato plants, potash has no effect on susceptibility to *V. albo-atrum*. When, in tests conducted at all seasons of the year, tomato plants receiving adequate supplies of nutrients were divided into three groups (the first having all the secondary shoots, flowering spurs, and terminal bud pruned, the second left unpruned, and the third having all but the youngest leaves stripped) and then inoculated 1, 10, 15, and 35 days after the first pruning, it was found that infection totals were considerably lower in the third group, ranging from 1 to 17 plants infected as compared with 5 to 63 and 5 to 67 in the first and second groups, respectively. This increased resistance to infection in plants with a reduced leaf-shoot ratio is attributed to reduction in the carbohydrate content of the host. The pruning of leaves not only reduced the number of plants that became infected but also the severity of the attack in infected plants, indicating that even after entering a plant the fungus is unable to maintain itself unless it is supplied with sufficient carbohydrate; it is suggested that this might explain the effect of shading in controlling the disease in plants already infected.

DAVIS (B. H.) & HAENSELER (C. M.). **Tomato seed treatment with new improved ceresan dust.**—*Phytopathology*, xxxiv, 9, pp. 847–848, 1944.

A simplified method for the treatment of tomato seed with new improved ceresan dust has been evolved at the New Jersey Agricultural Experiment Station, requiring a dosage of 0·5 per cent. by weight and five minutes' agitation of the seed. The treatment did not injure seed or seedlings, it prevented recontamination of seed held in cheesecloth bags by aerial micro-organisms for 28 weeks, and proved equally effective with the tedious dip method in the control of decay and damping-off. Composite samples of 40 lb. seed from four lots met the exacting requirements of the Georgia Department of Entomology and were planted in that State in the spring of 1944 to compare the relative efficiency of the dry and liquid methods. In tests with a commercial machine duster, of nine 100-seed samples from three treated lots, five were absolutely clean and the amount of fungal and bacterial contamination in any of the remainder did not exceed 2 and 1 per cent., respectively.

STRONG (M. C.). **Walnut wilt of Tomato.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxvi, 3, pp. 194–195, 1 fig., 1944.

Tomatoes growing within an average radius of 50 ft. (maximum 80) from black walnut trees in Michigan have been observed to suffer from a wilt caused by a toxic chemical compound in the roots, which has been identified by E. F. Davis (*Amer. J. Bot.*, xv, p. 620, 1928) as juglone. The symptoms of the trouble include wilting of the tops, eventually spreading over the whole plant, and sometimes a brown discoloration of the vascular tissues; they begin to develop a month or two after planting, and by harvest time the crop is generally useless. A similar phenomenon has been reported by M. T. Cook [in respect of potato and tomato: *R.A.M.*, i, p. 320], by A. B. Massey in connexion with lucerne, potato, and tomato (*Phytopathology*, xv, pp. 773–784, 1925), and by F. J. Schneiderhan as affecting apple trees (ibid., xvii, p. 529, 1927), while the writer was told in conversation by E. A. Bessey of the stunting of sugar beets within a 50-ft. radius of walnut and by R. Nelson of the death of asparagus and sweet cherry in a similar association.

BRETZ (T. W.). **Phloem necrosis of Elms in Missouri.**—*Plant Dis. Reptr*, xxviii, 30, pp. 929–931, 1944. [Mimeographed.]

Phloem necrosis of elms [*R.A.M.*, xxiv, p. 80] having reached epidemic proportions in the St. Louis and Kansas City areas of Missouri, a survey was made of these districts which yielded the following information. In a single subdivision of St. Louis, some 150 10- to 15-year-old trees were observed in all stages of decline. Every trunk base and buttress root examined showed the characteristic 'butterscotch'-yellow discoloration of the phloem, frequently accompanied by a faint but unmistakable odour of winter-green. A similar condition was typical of the 75 to 100 dying or dead trees included in the Kansas City inspection.

On pp. 931–932 of the same issue J. S. Tidd reports extensive mortality among elms in Indiana from a disease suspected of being identical with phloem necrosis.

SCHUSTER (C. E.) & STEPHENSON (R. E.). **Preliminary report on the use of B on Walnut trees (Juglans regia L.)**—*Rep. Ore. hort. Soc.*, xxxv, pp. 133–137, 1943. [Abs. in *Chem. Abstr.*, xxxviii, 10, p. 2435, 1944.]

'Snakehead' and die-back of Persian walnuts in Oregon appear to be associated with a deficiency of available boron in the soil, while a shortage of the same element may also be a cause of leaf scorch and leaf roll, the set of fruit and yield of nuts depending to some extent on the correction of the condition. The upper limit for safe application to 15- to 20-year-old trees on fairly heavy soils is 7 to 10 lb. borax per tree, incorporation in the soil being preferable to insertion into the bark or spraying. Two to four years may elapse before the beneficial effects of the soil treatment become apparent.

BAXTER (D. V.). **Pathology in forest practice.**—xi+618 pp., 178 figs., 26 diags., 14 graphs, 9 maps, New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1943. [Received December, 1944.] $5·50.

In a foreword to this treatise, S. T. Dana, School of Forestry and Conservation, University of Michigan, states that it 'is intended primarily for the student, the timber grower who is interested in the health of the forest, and the timber user who is concerned with the soundness of its products. It consequently pays little attention to the minutiae of taxonomy, mycology, and etiology, but attempts rather to provide a working knowledge of the conditions which cause disease and of the practical measures which can be taken to reduce its incidence or its severity.' The scope of the work may be indicated by the chapter headings, viz., I, plant disease, II, the fungi which cause disease, III, loss and appraisal of damage, IV, relation of nursery site and practice to disease incidence, V, relation of site and

cultural practice to disease incidence in plantations, VI, relation of site and cultural practice to disease incidence in the mature forest, VII, relation of fungi and certain other plant pests to disease in the mature forest, VIII, relation of site and care of shade and park trees to disease incidence, IX, handling and treatment of forest products in relation to decay and certain other defects, X, discolorations, stains, and molds in forest products. Chapter II comprises a non-technical key to the principal genera and species of the Agaricales likely to concern the forest pathologist, and each chapter is followed by a bibliography of the relevant literature.

CAVE (MARION S.). **Modification of procedure for differentiating the telia of Cronartium ribicola and C. occidentale.**—*Stain Tech.*, xix, 4, pp. 141–142, 1944.

The following shortened procedure has proved equally satisfactory with the original method of Acree and Goss for the differentiation of the teleutosori of *Cronartium ribicola* and *C. occidentale* [*R.A.M.*, xvii, p. 150] on the basis of a comparison of the two schedules for the examination of over 184 specimens in three seasons. A piece of *Ribes* leaf blade, 5 by 5 mm., bearing mature, ungerminated teleutosori, is excised and placed (teleutosori downwards) in a watch glass, covered with 2 ml. N/10 hydrochloric acid, and left for five minutes, whereupon it is rinsed in distilled water, immersed for ten minutes in the same, making two changes, blotted on filter or neutral blotting paper, placed on a slide under a dissecting microscope, the teleutosori teased from the leaf blade with a dull scalpel, allowed to dry for one to three minutes before adding a drop of 0·001 *M* brom phenol blue (P_H 7·6), and the cover glass set aside for twenty minutes before examination under the microscope. The spore contents (the matrix should be disregarded) of *C. ribicola* teleutosori turn blue and those of *C. occidentale* green.

FRACKER (S. B.) & BRISCHLE (H. A.). **Measuring the local distribution of Ribes.**—*Ecology*, xxv, 3, pp. 283–303, 5 graphs, 5 diags., 1944.

Ensuring, before or after the eradication of *Ribes* spp. against spread of white pine blister rust [*Cronartium ribicola*], that the *Ribes* in a stand are so few that they offer no threat to the trees, involves a systematic check of the stand and its environs. Checkers are usually required to cover either 4 or 5 per cent. of the land area under examination, and to report the number and location of the *Ribes* found. The present paper gives a detailed account of studies made to determine how accurately the sampling data obtained from a 4, 5, or 8 per cent. check indicate the specific unit areas on which the *Ribes* present are located, and to ascertain the extent to which these criteria are affected by raising the checking of records above 4 or 5 per cent. of the land area. Statistical evidence indicates, *inter alia*, that increasing the percentage of check makes possible a proportionate decrease in either the unit size of the plot or the minimum *Ribes* population class about which information is desired.

FRÖHLICH (J.). **Über den Befall der Fichte in den Ostkarpaten durch Trametes pini Fr.** [On the infection of Spruce in the eastern Carpathians by *Trametes pini* Fr.]—*Z. ges. Forstw.*, lxxv, 4–6, pp. 152–156, 3 figs., 1943.

Trametes [*Fomes*] *pini* is the most destructive pathogen of 100-to-300-year old spruces in the middle ranges (600 to 1,200 m. above sea-level) of the eastern Carpathians, involving 10 to 30 per cent. of the trees in mixed stands. The predominating species in the region are beech and fir [*Abies*], but the unmarketability of such a large proportion of the timber, even of the comparatively small spruce population, represents a substantial loss. Control measures, having regard to the vast extent of the affected forests, are quite impracticable, and the sole means of avoiding loss is to relegate the host to its natural habitat in the upper mountain ranges (1,200 m. above sea-level and upwards). The present policy of restocking the woods with spruces to replace those killed by the disease is quite indefensible.

BECKER (K. E.). **Zur Beizung kleiner Mengen von Gemüse and Gewürzsaaten.** [On the steeping of small quantities of vegetable and condiment seeds.]—*Forschungsdienst*, xvii, 5, pp. 267–269, 1944.

A special method was devised at the Bernburg (Anhalt) Experiment Station to obviate the necessity for weighing the minute quantities of fungicidal materials required for vegetable and condiment seed treatment. It involves the admixture of 25, 50, or 75 per cent. talc with the material, which is then powdered over the seed for three minutes until a thorough coating is obtained, the excess being removed through a sieve. The seeds are germinated in quartz sand or on filter paper at 18° to 20° C. for the regulation periods prescribed for each kind by the Reich Union of Agricultural Research Institutes, with an additional reading of germinative energy three days after the final term and a count of germinative capacity interpolated between the 7th and 14th days. The percentages at which abavit, ceresan, fusariol, and germisan could safely be applied in this manner are presented in tabular form: they ranged from 0·25 (for kidney beans) to 1·4 (poppy [*Papaver somniferum*]), 0·32 (leek) to 1·4 (*P. somniferum*), 0·25 (bean and radish) to 1·4 (*P. somniferum*), and 0·32 (leek) to 1·4 (*P. somniferum*), respectively, the corresponding figures for cereals being 0·8 (barley and wheat) to 1·4 (oats) for abavit and 0·2 (barley, wheat, and rye) to 0·3 (oats) for the other three preparations.

Service and regulatory announcements. List of intercepted plant pests, 1943.—*S.R.A., B.E.P.Q., U.S. Dep. Agric*, 35 pp. 1944.

Pathogens intercepted on plant material entering United States territory during the period from 1st July, 1942, to 30th June, 1943 [*R.A.M.*, xxii, p. 416], included *Cercospora musae* [*Mycosphaerella musicola*], again detected on bananas from Honduras [loc. cit.], *C. personata* on groundnuts from Mexico, *Claviceps paspali* on *Paspalum dilatatum* from Australia, *C. purpurea* on *Lolium* sp. from Uruguay, *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on rice from Salvador and *Nigrospora oryzae* on the same host from India and Portugal, *Monilinia cinerea* [*Sclerotinia laxa*] on cherries from Portugal, *Myrothecium roridum* on *Agave* sp. from Mexico, *Phoma terrestris* on parsnips from England, *Phytophthora capsici* on chilli, *Pseudoperonospora* on squash (*Cucurbita maxima*) and *Pythium aphanidermatum* on string beans from Mexico, *Sphaceloma perseae* on avocado from the American Virgin Islands and Jamaica, and *Vermicularia* [*Colletotrichum*] *capsici* on tomato from Colombia.

Distribution maps of plant diseases.—Maps 49–72. Issued by the Imperial Mycological Institute, 1944. 3*s.* 9*d.*

The third year's issue of this series of maps showing the world distribution of major crop diseases [*R.A.M.*, xxiii, p. 80] comprises (No. 49) groundnut rosette virus on groundnut, (50) *Sclerotinia fructicola* on plum, peach, apricot, cherry, etc., (51) *Piricularia oryzae* on rice, (52) *Rhabdocline pseudotsugae* on *Pseudotsuga taxifolia*, (53) *Phoma citricarpa* on citrus, (54) *Fusarium conglutinans* on cabbage, broccoli, cauliflower, etc., (55) *Elsinoe australis* on citrus, (56) aster yellows virus on *Callistephus chinensis*, lettuce, etc., (57) *Xanthomonas malvacearum* on cotton, (58) *Coccomyces hiemalis* on cherry, (59) *Cercospora coffeicola* on coffee, (60) peach yellows virus on peach, (61) *Gymnosporangium juniperi-virginianae* on apple and *Juniperus*, (62) *Phytophthora fragariae* on strawberry, (63) *Alternaria longipes* on tobacco, (64) *Corticium koleroga* on coffee, citrus, etc., (65) citrus psorosis virus on citrus, (66) *Endothia parasitica* on chestnut, (67) *Corynebacterium insidiosum* on lucerne, (68) *Melampsora lini* on flax, (69) *Sorosporium reilianum* on maize, sorghum, (70) *Phytophthora cambivora* on chestnut, beech, maple, etc., (71) *Cercospora oryzae* on rice, and (72) *Didymella applanata* on raspberry and loganberry.

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Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lv, 10, pp. 426–429, 9 figs., 1944.

Brief notes are given on some diseases of broad beans in New South Wales. In most seasons, the chief causes of loss in this crop are [tomato] spotted wilt virus [*R.A.M.*, xix, p. 255] and rust (*Uromyces fabae*) [ibid., xx, p. 442]. Spotted wilt is most troublesome in mild winters and is most prevalent in urban areas, particularly in home gardens.

On young, vigorous broad bean plants the first symptoms appear as dark brown spots on the leaves, blighting and blackening of the young shoot, and dark brown streaks on the upper stem, often on one side only. The growing point of the shoot is often killed, but sometimes the plant partially recovers, producing small, pale leaves with light and normal green areas and margins that tend to roll upwards. Young pods present at the time of infection may develop black spots which become sunken pits, or such pods may become completely blackened. Young growth from the base of the plant is mottled, and the leaflets are small, with curled-up margins.

When more mature plants are affected, tip blight and the dark streaks on the stem may be absent, but new leaves formed after infection are mottled and the margins are curved up. The mottling may show no definite pattern, but occasionally round spots or vague concentric rings are visible. Affected plants should be removed and burnt.

Dusting with sulphur at weekly intervals assists in checking the spread of *U. fabae*. Chocolate spots are caused by *Ascochyta fabae* [ibid., xi, p. 143], and also by *Botrytis cinerea* [ibid., xxiii, p. 467], and root and crown rot by *Rhizoctonia* [*Corticium*] *solani* [ibid., xxii, p. 462; xxiii, p. 160]. Losses due to the last-named fungus are reduced by delaying sowing until the soil temperature has fallen (early April in coastal areas), seed-dusting with cuprox, oxycop, agrosan, or ceresan, and using a superphosphate fertilizer.

STOKER (G. L.). **Soil deficiencies as related to Sugar-Beet seed production in the Willamette Valley, Oregon.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 103–111, 1943.

Evidence is adduced that yellowing of sugar beets in the Willamette Valley, Oregon, may be caused by nitrogen deficiency, and the application of ammonium sulphate at the rate of 400 to 600 lb. per acre gave very promising results. The overhead sprinkling type of irrigation used provided a very easy and effective method of applying nitrogen to beets grown for seed when the plants were approaching the bloom stage.

In the autumn of 1939, agricultural sulphur was applied at the rate of 94 lb. per acre to a number of sugar beet plots. Both the sulphur and no-sulphur plots received three different nitrogen treatments, viz., 318 lb. sodium nitrate in autumn plus 330 lb. in spring, 333 lb. in autumn and 330 lb. in spring, and 100 lb. in autumn only. The following spring the plants in the sulphur plots grew vigorously, bolted uniformly, and had waxy green leaves, while those in the no-sulphur plots were

yellow and in a few cases showed white leaves. Yellowing was accompanied by breakdown of the leaf tissue, and leaf spot [*Cercospora beticola*] was very prevalent. As the season advanced, many leaves died. Numerous plants developed floral bracts and remained vegetative, retaining their yellowish-green colour until harvest. No response was obtained from sulphur when the spring nitrogen was omitted, and in the absence of nitrogen, the sulphur plots remained indistinguishable from the no-sulphur. The average yield of the sulphur and no-sulphur plots was, respectively, 1,578 and 1,235 lb. clean seed per acre.

Boron-deficiency symptoms were modified by winter temperatures, to which the plants were subjected by the over-wintering method of producing seed. Seed-stalk injury due to boron deficiency [*R.A.M.*, xx, p. 618] was first observed locally in the summer of 1938. In the winter of 1939–40, it was noted that the leaves of beet that received 30 lb. borax per acre before planting were a normal, green, whereas those that received no boron were severely frosted. Beets given lime but no boron showed the worst frost damage. As colder weather set in, other boron-deficiency symptoms appeared. The first were thickening, dwarfing, and crinkling of the leaves, which were very brittle. The petioles were short and often contained a rusty cross-checking on the concave side. Where the stand was thin, the leaves flattened out, giving the plants a rosette appearance. The tips of the youngest centre leaves turned black. Finally, the whole growing point died, and the outer, older leaves became badly frosted. During late winter or early spring new buds appeared on the crowns where the leaves had decomposed. The roots developed a discoloration and breakdown of the tissue immediately under the epidermis, which broke or rotted, leaving a reddish-brown decomposed material or canker area confined to the outer tissue.

In plants not given an application of borax in January, the upper part of the seed stalks developed a black discoloration in June, which arrested the terminal growth. Later, many plants made some recovery, secondary growth developing from the lateral buds below the injured area and forming a witches' broom. The tips of this secondary growth later turned brown to black.

BLACKFORD (F. W.). **Sclerotinia or cottony rot.**—*Qd agric. J.*, liii, 3, pp. 161–163, 2 figs., 1944.

Lettuce, cabbage, French beans, passion fruit, and sunflower are the principal hosts of *Sclerotinia sclerotiorum* in Queensland [cf. *R.A.M.*, xxi, p. 440]. The sclerotia of the fungus are mainly responsible for the perpetuation of infection in Queensland. Their numbers in the soil may be reduced by the cultivation of resistant crops, such as tomato, potato, cucumber, or beetroot, in succession to one that has sustained heavy damage from the disease, while other precautions should include the choice of sunny, well-drained sites and reasonably wide spacing to promote air circulation. In small gardens, infected plants should be uprooted and burnt, and after harvesting a solution of 1 lb. copper sulphate in 7 gals. water should be applied to the soil at the rate of 2 gals. per sq. yd.

GIDDINGS (N. J.). **Age of plants as a factor in resistance to curly top of Sugar Beets.** —*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 452–459, 4 graphs, 1943.

In an experiment carried out in 1939 at Riverside, California, plantings of the U.S. 22 variety of sugar beet (highly resistant to curly top) and the susceptible R and G Old Type were made on 20th January, 20th February, and 21st March. On 17th April, every alternate plot was inoculated with curly top by placing viruliferous leafhoppers on young leaves.

In both the inoculated and uninoculated plots of Old Type, the January planting showed greater curly-top resistance than the February planting, while the February planting was much more resistant than the March. No planting of Old Type

outgrew the disease within two months of inoculation. In the inoculated plots of U.S. 22, the January planting showed less curly top than the February, and both were much more resistant than the March. The inoculated plots of U.S. 22 showed very little disease and no difference in amount between the January and February plantings, but both were much more resistant than the March planting. U.S. 22 showed good ability to outgrow the disease, particularly in the March plantings.

In 1941, plantings of Improved U.S. 22 and Old Type varieties were made on 27th February and 22nd March, the inoculations being carried out on 24th April. In this case also the earlier plantings showed distinctly greater resistance than the later ones. It is concluded that, in general, early planting of sugar beets in curly-top areas is highly desirable.

MUNCIE (J. H.). **Dusting and spraying Sugar Beets in Michigan for control of Cercospora leafspot.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 430–434, 1943.

In State-wide field-strip trials carried out in Michigan in 1941, sugar beet plots dusted against *Cercospora* [*beticola*] with bordow F–132, cuprocide 6-84-10, tribasic copper sulphate-talc-bentonite 14-71-15, and monohydrated copper sulphate-lime-pyrax 20-60-20 gave increased yields of 504, 451, 621, and 439 lb. recoverable sugar per acre, respectively, as compared with undusted plots, the differences required for significance at 5 per cent. level being 365, 411, 599, and 393 lb., respectively. No significant differences were noted between the mean yields of plots treated with the first three dusts.

Plots at Blissfield, Michigan, given applications of monohydrated copper sulphate-lime-pyrax 20-60-20, monohydrated copper sulphate-lime-eastern magnesia talc 20-60-20, and tribasic-eastern magnesia talc-bentonite 12-73-15 gave yields of 3,984, 3,401, and 3,514 lb. recoverable sugar per acre, respectively, compared with one of 2,839 lb. for the control, the differences being significant.

Spraying with Bordeaux mixture 8-4-100 and tribasic copper sulphate-lime 4-4-100 gave gross yields of 4,858·8 and 4,897·1 lb. compared with 4,030·3 for the control, both increases being significantly above the unsprayed plots, but the difference between the sugar yields of the sprayed plots was not significant.

WALLACE (J. M.). **Acquired immunity from curly top in Tobacco and Tomato.**—*J. agric. Res.*, lxix, 5, pp. 187–214, 1 col. pl., 8 figs., 1944.

The experiments described in this paper preceded those discussed by Wallace and Lesley [*R.A.M.*, xxiii, p. 281]. Over a period of three years, 1939 to 1941, only one out of 800 plants of commercial tomato varieties recovered from artificial infection with beet curly-top virus, indicating that tomato plants do not acquire active immunity easily. When, on the other hand, tomato plants were grafted with Turkish tobacco scions in which recovery, or the reaction leading to recovery, had occurred, they acquired an immunity similar to the passive type observed in recovered tobacco plants. The retention of this acquired immunity in the tomato plants through many successive propagations suggested that an active process was in operation. In tests with a number of strains of curly-top virus it was shown that, depending upon the strain used, the protection afforded varied from complete to slight, the variation in vigour of plants and symptom manifestation being fairly consistent and apparently due to the virus strain rather than to individual plant reaction. Tomato clones immunized by single virus strains and then reinoculated with others displayed, both in the greenhouse and the field, a definite specificity of immunization, affording a high degree of protection against some strains and a lower one against others. The results demonstrate the operation of some kind of cross protection within tomato plants immunized against and carrying virulent strains of the virus, which differs from ordinary cross protection in that (1) the mild symptoms of the immunized plants are not due to the presence of a virus

strain of low virulence, and (2) the degree of protection varies with the virus strain used for the immunization of the plant and for the reinoculation. It is concluded from these studies that recovery and acquired immunity from curly top in tomato cannot be explained by strain antagonism or correlated with virus invasion of immature tissues; in both tobacco and tomato it appears to differ fundamentally from similar phenomena described for other plant viruses and to be closely comparable to reactions known for animal viruses.

DILLON WESTON (W. A. R.). **Downy mildew of Sugar Beet.**—*J. Minist. Agric.*, li, 10, pp. 468–470, 1 fig., 1945.

This is a brief, popular note on the sugar beet downy mildew (*Peronospora schachtii*) and its control [cf. *R.A.M.*, xxiv, p. 105].

PRICE (W. C.). **Thermal inactivation of southern Bean mosaic virus.**—Abs. in *Amer. J. Bot.*, xxxi, 8, pp. 4s–5s, 1944.

When the numbers of lesions produced by southern bean mosaic virus [cf. *R.A.M.*, xxiii, pp. 203, 204] on Early Golden Cluster beans were plotted against time in minutes at a given temperature, the points obtained fell along a straight line, thermal inactivation of the virus at the given temperatures following a first-order reaction. The slopes of the lines give the inactivation rates. A study of these rates at temperatures from 65° to 95° C. at 5° intervals showed that the virus has a temperature co-efficient (Q_{10}) of about 3·1 and an energy of activation (E) of about 27,750 calories per mole, the corresponding values previously found for tobacco necrosis virus being 4·0 and 37,300 between 70° and 95° and for tobacco mosaic 9,500 and 195,000 between 83° and 95°.

WHITE (N. H.) & RAPHAEL (T. D.). **The reaction of green Pea varieties to downy mildew and two viruses.**—*Tasm. J. Agric.*, xv, 3, pp. 92–93, 97, 104, 1 fig., 1944.

In the 1943–4 trials at Summerleas Experimental Station, Tasmania, peas were affected by downy mildew (*Peronospora pisi*) [*R.A.M.*, xv, p. 194], the marble strain of common pea mosaic [ibid., xxiii, p. 85], and a virus disease resembling that due to the pea enation [mosaic] virus [ibid., xix, p. 561; xxiii, p. 166]. The peas were grown in three localities, and while all these diseases were present in each, their intensity varied.

Where moist, warm, sheltered conditions prevailed, downy mildew was very prevalent, but some varieties growing between heavily infected rows showed no symptoms. Mosaic incidence was very low; plants with well-marked symptoms were mostly isolated, the surrounding peas being unaffected. Enation mosaic, on the other hand, was widely distributed, and frequency was high. The varieties W. F. Massey, Radium, Perfection, and Perfection S.E.S.1 showed none of these three diseases. Observations suggested that the effects of enation mosaic and downy mildew upon pea yields may in certain circumstances be considerable.

KOEHLER (B.). **New developments in Soybean disease studies.**—*Soybean Dig.*, iv, 8, pp. 6–7, 3 figs., 1944.

Charcoal rot of soy-beans [*Macrophomina phaseoli*] has been observed to increase in prevalence towards the southerly range of the host, while sclerotial blight [*Sclerotium rolfsii*] is confined to the southern States of the American Union. At Stoneville, Mississippi, pod and stem blight [*Diaporthe phaseolorum* var. *sojae*] completely destroyed a field too early in the season for any of the plants to be harvested. The case was reported by J. A. Pinckard, Mississippi Agricultural Experiment Station, and the disease confirmed by W. B. Allington, U.S. Regional Soybean Laboratory. The risk of heavy losses through disease appears, in fact, to

be so great in the south as to preclude the large-scale extension of soy-bean cultivation.

In 1940 and 1941, soy-beans at the Illinois Agricultural Experiment Station were observed to be spotted and falling off in alarming numbers, and the causal agent was determined by R. W. Samson, of Purdue University, as the tobacco ring-spot virus. The same pathogen attacked soy-beans in an entirely different manner at the Iowa Agricultural Experiment Station in 1942, causing 'bud blight', external symptoms of which consist of dwarfing and curving of the youngest parts of the stems at the top or at the ends of the branches or both, and brown, necrotic, deformed areas on the leaves. W. B. Allington, who confirmed the responsibility of the ring-spot virus for both these manifestations, also pointed out another symptom, namely, brown, necrotic lesions in the interior of the stems, especially at their juncture with the leaf petioles. In the northern Mississippi Valley 'bud blight' appears to rival in importance the several bacterial blights, of which the most common in Illinois is bacterial pustule [*Xanthomonas phaseoli* var. *sojae*].

Co-operative seed-treatment tests have recently been carried out in Ohio, Illinois, Iowa, Missouri, Kansas, Nebraska, South Dakota, Minnesota, and Wisconsin with ceresan, semesan jr., fermate, spergon, and arasan. In the three northern States a Manchu type of soy-bean was used, and here spergon (3 oz. per bush.) gave the highest stand increases, with a maximum of 47·4 per cent. and an average for the three of 27·4 per cent. In the other six States the Lincoln variety was grown, and the best results were obtained with arasan (2 oz.), which resulted in an increase of 42·8 per cent. at the Ohio Station and an average of 17·7 per cent. for all locations. Only one of the seven test crops harvested (South Dakota) showed a significant increase of yield over the controls, so that no general recommendations in favour of seed treatment can yet be made on this basis.

In a series of tests by R. H. Porter, the emergence of the Mukden seed-type soy-bean was significantly benefited by seed treatment with spergon and arasan ($1\frac{1}{2}$ and 1 oz., respectively) in six out of 13 central and eastern States. Both these fungicides also gave satisfactory results, as regards stand and yield, in an independent trial by J. W. Heuberger and T. F. Manns at the Delaware Agricultural Experiment Station.

Obregón Botero (R.) & Otoya (F. J.). **Aspecto de la agricultura intensiva en la Provincia de Ocaña, Departamento Norte de Santander.** [A survey of the intensive agriculture in the Province of Ocaña, Northern Santander Department.]—*Rev. Fac. Agron., Medellin*, iv, 14–15, pp. 1645–1729, 21 figs., 1 diag., 1941. [Received November, 1944.]

Onions are one of the crops cultivated on a large scale in Ocaña, Northern Santander, Colombia, where the most important disease is purple blotch (*Macrosporium* [*Alternaria*] *porri*). Mildew (*Peronospora schleideni*) [*P. destructor*], 'enrollamiento' [leaf roll = ? yellow dwarf] (the first record for the country), white rot (*Sclerotium cepivorum*), and black mould (*Aspergillus niger*) were also observed. The slight increases in yield obtained by spraying with Bordeaux mixture and nicotine against purple blotch do not appear to justify the use of a fungicide, and directions are given for the control of the disease by sanitary measures, including the use of healthy seed, avoidance of excessive humidity (sparing irrigation), and crop rotation, e.g., with beans and groundnuts.

Green (D. E.). **A suspected virus disease of Shallots and Onions.**—*J. R. hort. Soc.*, lxx, 1, pp. 24–29, 4 figs. (between pp. 18–19), 1945.

Attention has already been drawn by Ogilvie and Walton to the occurrence of a disease presumed to be identical with yellow dwarf on shallots in England [*R.A.M.*,

xx, p. 442], and the writer has since observed it in a milder form on onions and leeks. On onions grown for seed the pale yellow to nearly white, broad stripes are most conspicuous on the flower stems, though they also appear on the leaves. As a rule, stunting of the flower stalk is not severe, but the seed weight is reduced and its vigour impaired. The foliage of autumn-sown plants shows a yellowish streaking, accompanied by some degree of crinkling, general pallor, and limpness, similar but less pronounced symptoms being characteristic of affected spring-sown onions. Yellowish stripes of varying width also develop on leek leaves. In a test at the Royal Horticultural Society's Garden, Wisley, Surrey, in 1943, the average weights of 50 sound and diseased mother shallot bulbs planted on 2nd February were 9·8 and 6 gm., respectively, and those of the progeny lifted on 8th August 57 and 17·5 gm., respectively. Pending further studies on the identity of the disease, which is similar in its symptoms to yellow dwarf, growers are advised to locate their seed-onion plots at a distance from striped shallots or onions.

STUBBS (L. L.) & GRIEVE (B. J.). **A new virus disease of Carrots.**—*J. Dep. Agric. Vict.*, xlii, 9, pp. 411–412, 415, 6 figs., 1944.

Carrots in the Melbourne market-garden area and, during the last two years, in the newly developed carrot-growing areas of Gippsland and the Western District of Victoria, have become affected by a disease the severity of which is such that successful crops of the usual commercial varieties can now be grown only in summer.

The first symptom on young plants at the 3 to 4 fern-leaf stage is a reduction in length and a slight twisting of the petiole of the leaf which emerges immediately after infection. The individual leaflets which appear subsequently are reduced in size. A chlorotic condition (almost a mosaic of light and dark green areas) next appears on the leaves; the leaf petioles become twisted, and the plant remains stunted and fails to produce marketable roots.

Plants in an intermediate stage of development show stunting of the leaves; the petioles and subpetioles are often twisted, and those of the older leaves are sometimes S-shaped, or bent backwards so that the under surfaces of the leaves fall upwards. The groove along the petiole of twisted leaves is thrown into relief. Individual leaflets are twisted, distorted, and small. The outer leaves show an irregular chlorotic mottle, which is replaced by a marginal chlorosis, this in turn giving way to marginal reddening. The inner leaves show some chlorosis.

On plants approaching maturity, the petioles of leaves emerging immediately after infection are distorted, twisted, and shortened, so that the inner leaves have a rosette appearance. The petioles of these leaves are brittle, and sometimes show brown, necrotic streaks. Outer leaves developed before infection usually remain unaffected.

Experimental evidence demonstrated that the disease is transmitted by a common aphid pest of carrots provisionally identified as *Cavariella aegopodii scopoli*. It was also ascertained that *Salix vitellina*, a host on which this insect is often found, is not susceptible to the disease, and that ability to transfer infection is not heritable in the progeny of originally infective aphids.

In field tests, the following varieties were susceptible: Chantnay, Danners Half Long, Hutchinson's Imperator, Nantes, Morse's Bunching, Oxheart, and Short Horn. A variety commonly referred to in Victoria as West Australian (synonyms, Osborne Park, Champion Long Red, Champion Intermediate), and a Victorian grower's selection of a similar type were found to be highly tolerant. This virus appears to be a new record.

RAMSEY (G. B.) & SMITH (M. A.). **Orange rust a market factor in Colorado Spinach.** —*Plant Dis. Reptr*, xxviii, 29, pp. 911–912, 1944. [Mimeographed.]

Spinach rust (*Puccinia aristidae*, syn. *P. subnitens*) has not assumed an econo-

mically important form in the United States since 1922 [*R.A.M.*, ii, p. 100]. In 1943 and 1944, however, it seriously damaged market crops, both of the flat and curly types, on the river bottom land of the Denver district of Colorado, where the alternate uredo and teleuto phase occurs on salt grass (*Distichlis stricta*). In some fields the severe spotting of the leaves on 50 to 90 per cent. of the plants necessitated the ploughing-up of the stands. The pale yellowish-green spots, 1 to 2 mm. in diameter, are most prominent on the under sides and rapidly expand, the aecidia with their bright orange spores being conspicuous in the centres at an advanced stage of infection.

COOPER (R. F. V.). **Mancha foliar del Apio o 'ceniza' (Septoria apii y Septoria apii-graveolentis).** [Leaf spot or 'ashes' of Celery (*Septoria apii* and *Septoria apii-graveolentis*).]—*Rev. B.A.P.*, xxvii, 320, pp. 55–57, 1 fig., 1944.

This is a popular note on the celery leaf spots caused by *Septoria apii* and *S. apii-graveolentis*, which have assumed an exceptionally severe form in Mendoza, Argentina [*R.A.M.*, xx, pp. 9, 511], owing to the abnormally heavy precipitation of 1943 and 1944. No original work on the control of the pathogens has yet been published in Argentina, but seed treatment with mercuric chloride and spraying the crop with Bordeaux mixture are recommended.

THOMPSON (R. C.), DOOLITTLE (S. P.), & SMITH (F. F.). **Investigations on the transmission of big vein of Lettuce.**—*Phytopathology*, xxxiv, 10, pp. 900–904, 1944.

Big vein of lettuce [*R.A.M.*, xxii, p. 209] was conclusively proved by experiments at the Plant Industry Station, Beltsville, Maryland, to be soil-borne, its agent being inactivable by three hours' steam sterilization at 10 lb. pressure as reported by Jagger and Chandler [ibid., xiv, p. 283]. The symptoms of the disease did not appear in any of the plants until they had been growing for five weeks in infested soil, and in some cases a period of up to 127 days elapsed before external signs of the disorder were noticed. Negative results were given by mechanical inoculation tests, while the preliminary trials with insects do not as yet justify a positive conclusion, though there are indications that the root aphid, *Pemphigus lactucae*, may serve as a vector of big vein.

BLACKFORD (F. W.). **Downy mildew and Septoria leaf spot of Lettuce.**—*Qd agric. J.*, lix, 4, pp. 221–223, 2 figs., 1944.

Lettuce downy mildew (*Bremia lactucae*) [*R.A.M.*, xxiii, p. 55] is of frequent occurrence in Queensland, where, however, it only occasionally causes serious damage. It is most prevalent in winter and spring, and spreads very rapidly when cool, moist conditions obtain in overcrowded or shaded seed-beds. Control is materially assisted by sparse sowing and by thinning out the plants as early as possible. If the lettuces are kept healthy in the early stages of growth, very little trouble should be experienced later. If previous crops have been affected, the lettuces should be sprayed once or twice with Bordeaux mixture (3–2–40) or home-made cuprous oxide (3–40); the first treatment should be applied shortly after the first true leaves have formed, and the second about a week later. If transplanting is to be effected, spraying should be completed three or four days beforehand.

Very few plantings are free from leaf spot (*Septoria lactucae*) [ibid., xx, p. 193]. Infection is generally present, even in the healthiest plantings, on the lower leaves of some plants, but as these leaves usually die before the plant is picked or are removed before packing, the condition is of no importance. When infection is found on the leaves of the marketable head or is well established on half-developed plants, it is probable that the plants have suffered some check to their growth,

which has permitted the fungus to pass farther up the stalk than is normally the case. If the disease has developed extensively, growers should search for possible causes of a check to growth and eliminate these factors.

BENNETT (C. W.). **Studies of Dodder transmission of plant viruses.**—*Phytopathology*, xxxiv, 10, pp. 905–932, 3 figs., 1944.

In experiments at the Sugar Plant Field Laboratory, Riverside, California, three species of dodder, *Cuscuta subinclusa*, *C. campestris*, and *C. californica*, were tested for their ability to transmit 12 viruses from diseased to healthy plants. All three species conveyed dodder latent mosaic [*R.A.M.*, xxiii, p. 248] and cucumber mosaic to high percentages (up to 100) of the inoculated plants, while sugar beet curly top and tomato spotted wilt were transmitted to smaller numbers. Mustard (*Brassica adpressa*) mosaic (probably related to mild mosaic of annual stock [*Matthiola incana* var. *annua*: ibid., xviii, p. 459]) was transmitted to a high proportion of inoculated plants by *C. californica*, the other two dodders being less effective. *C. californica* was also the only one of the three species to communicate tobacco etch from infected to healthy Turkish tobacco plants. On the other hand, it failed to transmit tobacco mosaic to the same host, while the other two dodders were able to infect a small percentage. None of the dodders proved capable of transmitting the viruses of sugar beet mosaic, sugar beet yellow vein, tomato ring spot, citrus psorosis, or peach mosaic.

In tests to determine the longevity of viruses in dodder growing on non-infected hosts, the cucumber and dodder latent mosaic viruses were active in the three species after periods of one to four months, whereas ten days was the maximum for the recovery of beet curly top. The mustard mosaic virus was still operative in *C. californica* after 20 but not after 40 days, while that of tobacco etch persisted in the same species of dodder for periods of two to four weeks.

The dodder latent mosaic virus was transmitted through 2·4 and 4·9 per cent., respectively, of the seeds of *C. californica* and *C. campestris*, and was active in those of the latter species after one year's storage.

The movement of the beet curly-top and cucumber mosaic viruses in dodder stems was much more rapid towards the growing points and away from the host than in the opposite direction. Growth of dodder on one shoot of beet plants with three shoots on a single root system induced migration of the curly-top virus from an inoculated shoot in periods of 32 to 46 days, whereas control shoots remained free of symptoms for 113 to 149 days. The tracheal elements of dodder unite directly with those of the host through the haustorium, while food materials evidently pass rapidly through the cells connecting the phloem of the parasite with that of the host. The walls of some of the exterior haustorial cells are traversed by lines that appear to be plasmodesmata and may be joined to similar lines in the walls of adjacent host cells.

In conclusion, the mechanism by which a virus is picked up by dodder and passed on to the host is discussed.

MCKINNEY (H. H.). **Descriptions and revisions of several species of viruses in the genera Marmor, Fractilinea, and Galla.**—*J. Wash. Acad. Sci.*, xxxiv, 10, pp. 322–329, 1944.

In this paper the author describes and gives Latin names to several species and varieties of viruses infecting cereal and forage grasses, including the following: *Marmor tritici* var. *typicum* var.nov. for the wheat mosaic-rosette virus; *M. tritici* var. *fulvum* var.nov. for the prairie wheat yellow mosaic virus; *Marmor anularium* nom.nov. for the tobacco ring-spot virus; *M. constans* n.sp. for the virus inducing mild, dark green mosaic in tobacco; *Fractilinea tritici* n.sp. for the Russian wheat mosaic virus; *F. avenae* n.sp. for the Siberian oat mosaic virus (zakooklivanie

[pseudorosette]); and *Galla zeae* n.sp. for the wallaby ear disease of maize. The descriptions cover host reactions, transmission, mutation, physical properties, and geographical distribution. There is a bibliography of 37 titles.

RYJKOFF (V. L.). Основы учения о вирусных болезнях растений. (Общее учение о вирусах). [Basic theories of plant virus diseases. (General theory of viruses).].—224 pp., 39 figs., 3 graphs, Moscow-Leningrad, Acad. Sci. U.S.S.R., 1944.

In this book on virus diseases of plants the author summarizes all available knowledge on the subject in 12 chapters which fall roughly into three parts: the first deals with the nature of viruses, the second gives descriptions of various diseases and their control, and the third discusses the methods of studying viruses and virus diseases. A list of viruses based on K. M. Smith's system of nomenclature, with synonyms, and a 12-page bibliography are appended.

BAWDEN (F. C.). **Plant viruses and virus diseases.** Second Edition.—294 pp., 39 figs., 4 diags., 6 graphs, Waltham, Mass., U.S.A., The Chronica Botanica Company; London, W. 1, Wm. Dawson & Sons Ltd., 1943. $4.75.

Nothwithstanding the difficulties arising from war conditions, considerable progress has been made in the study of plant viruses and their associated diseases since the publication of the first edition of this useful treatise in 1939 [*R.A.M.*, xviii, p. 756]. The most extensive alterations in the present edition have been needed in the chapters dealing with the properties of viruses *in vitro* and their relationships with their insect vectors, in which field knowledge has advanced most rapidly. Some of the many controversial problems still at issue in 1939 have been resolved and could therefore be more briefly dealt with; in particular, the view that the specific proteins isolated from diseased plants are actually identical with the viruses themselves has found general acceptance. Little is yet known, however, of the behaviour of viruses in their natural habitat within the host, and it is this aspect of the subject on which attention should now be mainly focused.

HARRIS (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1943*, pp. 23–25, 1944.

A sample of one of the most promising East Malling raspberry seedlings was found to be entirely virus-free, while three others were highly infected with and tolerant of mosaic 2 [cf. *R.A.M.*, xx, p. 69]. The leaf curl disease affecting Norfolk Giant raspberries in Scotland [ibid., xxii, p. 441] was shown to be graft-transmissible. Observations suggested that local stocks of the Lloyd George variety may provide a major source of infection of Norfolk Giant. The disease appears to resemble closely the leaf curl disease of raspberry present in North America, particularly yellow blotch curl [ibid., xvii, p. 537]. Outside the area affected in Scotland no outbreaks were observed, except for leaf blotch symptoms on a wilding near London and on a seedling variety at East Malling.

Evidence that strawberry yellow edge [ibid., xxii, p. 240] and crinkle [ibid., xxii, p. 32] are due to virus complexes is accumulating, and it is believed that four distinct viruses have been isolated.

Cultural and pathogenicity studies of various strains of *Verticillium* from hop plants failed to reveal any differences between isolates from 'progressive' and 'fluctuating' outbreaks, respectively. They also supported the view that specific rank should be given to isolates provisionally referred, on morphological and physiological grounds, to *V. dahliae*, *V. albo-atrum*, and *V. nigrescens*.

WIEHE (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1943*, pp. 9–10, 1944.

In this report [cf. *R.A.M.*, xxiii, p. 252] it is stated that during the winter of

1943, cassava plantations in Mauritius were slightly attacked by *Gloeosporium manihotis* [ibid., xx, p. 564]. A serious disease of sweet potato of the anthracnose type, due to a species of *Colletotrichum*, occurred in one locality, where it destroyed about 100 acres of the crop, planted at different times; the condition has not previously been recorded in the island. A storage rot of the same host was found to be due to a species of *Rhizopus*.

Fifty-sixth Annual Report of the Rhode Island State College Experiment Station.—46 pp., 1944.

In this report on plant disease work in Rhode Island during 1943 [cf. *R.A.M.*, xviii, p. 727] it is stated that in that year one of the worst epidemics of apple scab [*Venturia inaequalis*] within memory was experienced. Unsprayed susceptible varieties showed up to 100 per cent. foliage infection and matured no fruit. Severely infected trees had lost 50 to 75 per cent. of their leaves by 1st September, and even trees carefully sprayed with the standard sulphur sprays sustained considerable foliage and fruit infection. The asci developed in the wet, overwintered leaves during the first two weeks in May until 95 per cent. were mature, but apparently no spores were discharged. Then, during the rainy period of 17th to 21st May, when the McIntosh blossoms were wide open, 95 per cent. of the ascospores were discharged, and by 1st June discharge was complete.

In greenhouse tests, Baldwin leaves sprayed with fermate [ibid., xxii, p. 261] (1½ lb. per 100 gals. water plus 1½ lb. fresh hydrated lime) showed some browning when the spray was applied at 90° or over, but no visible injury at 55° to 85°. A reduction in photosynthetic activity of from 2 to 20 per cent. occurred. With the fungicide Q1 (used at 1 in 5,000) no visible injury was observed, photosynthesis being reduced by 16 and 3 per cent. at 95° and 77°, respectively. Both materials may be used with reasonable safety so far as their effect on the food-manufacturing activity of apple leaves is concerned; application when the temperature is low appears to be desirable.

In a limited test on mature apple trees with an average yield of 29 bush. each, fermate used according to the manufacturers' directions caused no leaf injury. It gave 12 per cent. fruit scab, as against 17 per cent. for flotation sulphur (10 lb. per 100 gals.). There was no difference in russeting tendencies between the two materials. Fermate would appear to merit limited trials.

A new fungicide, puratized N5X, stated to be inexpensive, compatible with insecticides, non-injurious to foliage and fruit, equally potent in acid or alkaline water, and effective against scab at dilutions of 1 in 5,000 to 1 in 10,000, gave outstanding results in a comparative test of seven fungicides on the McIntosh and Baldwin apples. The next best was isothan Q4, which also had contact value against aphids. Camden paste sulphur (wettable sulphur) and fermate came third and fourth, respectively. Observations on 9th to 12th July showed that Camden paste allowed 59 per cent. of the McIntosh spur leaves to become infected and fermate 61 per cent. The combined fermate-lime spray caused marked necrotic flecking on 60 per cent. of the Baldwin foliage. If the striking control of scab given by puratized N5X and isothan Q4 is repeated, growers may profitably change to these materials in 1945.

An orchard of 400 McIntosh and Baldwin trees planted in 1939 was divided into five plots each of five trees of each variety and sprayed at the usual times (five applications) with lime-sulphur 1 in 50 (day), the same (evening), lime-sulphur 1 in 100 (day), lime-sulphur 1 in 50 (two applications) followed by flotation sulphur paste 10 lb. to 100 gals., lime-sulphur 1 in 50 (two applications) followed by kolofog 6 lb. to 100 gals., flotation sulphur paste 10 lb. to 100 gals., sulphur dust, and control. After five years, trunk diameter used as an index of total growth showed a marked varietal response to disease control and to spray injury. With the McIntosh

trees, all the treatments except lime-sulphur 1 in 50 gave significantly better results than did no treatment. Flotation sulphur, sulphur dust, and lime-sulphur 1 in 100 were significantly better than lime-sulphur 1 in 50 used throughout the season. Lime-sulphur followed by flotation sulphur or kolofog gave better growth than lime-sulphur applied throughout the season. With the resistant Baldwin, the unsprayed trees were significantly better than those sprayed with lime-sulphur 1 in 50, day or evening, throughout the season. The same held true for all other treatments except that there was no statistically significant difference between the control and any mild sulphur treatment. It seems that with Baldwin trees very little fungicide need be applied during the first five years in the orchard. A dust or wettable sulphur programme is recommended for McIntosh.

Preliminary experiments with brytene wax markedly reduced Jonathan spot on Jonathan apples. The more concentrated the wax emulsion used, the more complete was the control that resulted. Thus, brytene 489A 3·7, 6·5, and 26 per cent. gave, respectively, 3, 10, and 23 clean 18, 10, and 5 severely spotted fruits, and brytene 333-B 3, 6, and 24 per cent., 2, 14, and 20 clean fruits and 16, 6, and 3 severely spotted ones, respectively, as against only one clean fruit and 22 severely spotted ones in the controls.

For the third year in succession, dipping potato seed in mercury solutions, including semesan bel, retarded the early development of the plants, without giving any significant freedom from scab [*Actinomyces scabies*] or *Rhizoctonia* [*Corticium solani*], or any increase in yield. The results clearly indicated that early-harvested varieties, such as Cobbler, may be checked, not benefited, by seed treatment with mercuric chloride or yellow oxide of mercury. Fermate and isothan DL1, however, appeared to stimulate growth, the shoots emerging more quickly and blossoming occurring earlier when the seed was treated with these materials. Isothan DL1 gave the best yield.

Experimental evidence indicated that the cost of protecting potato foliage against late blight [*Phytophthora infestans*] during a dry season may be as high as 56 per cent. of the crop, if eight applications of Bordeaux mixture are made. The foliage of the sprayed plants remained green longer than that of the unsprayed, but the treated plants produced fewer tubers. However, in cool, rainy seasons Bordeaux mixture should be used.

Tests demonstrated that isothan Q4 (lauryl pyridinium bromide), isothan Q14 (lauryl quinolinium bromide), and isothan Q15 (lauryl iso-quinolinium bromide), when present at a concentration of five parts per million of water, kill pathogenic mould spores. They may safely be used on potato foliage, since injury begins when concentrations of 1 in 1,000 or more are used, and those of 1 in 5,000 to 1 in 10,000 are enough to control diseases. The property they possess of spreading over surfaces in droplets of water greatly enhances their fungicidal, bactericidal, and insecticidal value.

A second promising group of pesticidal compounds occurs among the quaternary ammonium compounds. It has been found possible to alter the toxicity to bacteria and fungi, injuriousness to vegetation, solubility in water, and wetting ability of these materials by changing the structure of the molecule. Among these chemicals are imularv, quartol, ammonyx Q, and isothan DL1. The inherent wetting action of the last named puts it in a class by itself. At dilutions of 30 parts per million it causes sprays to form a continuous film on plant surfaces.

A third group of chemicals investigated as potential fungicides consisted of a new type of organic mercury compounds. The best was puratized N5X [see above], which is used as a mildew-proofing agent on textiles [ibid., xxiii, p. 310]. In standard laboratory tests this material prevented the germination of more than 95 per cent. of the spores of *Macrosporium* [*Stemphylium*] *sarciniforme* at a dilution of three parts per million of water.

FRAMPTON (V. L.) & HILDEBRAND (E. M.). **Electrokinetic studies on Erwinia amylovora and Phytomonas stewartii in relation to virulence.**—*J. Bact.*, xlviii, 5, pp. 537–545, 1 graph, 1944.

No correlation was detected between the pathogenicity of *Erwinia amylovora* and *Phytomonas* [*Xanthomonas*] *stewarti*, the agents of pear fireblight and maize wilt, respectively, and their electrophoretic velocity, but the mobility-P_H curves at constant ionic strength appeared to be distinctive for each species. The mobility of *E. amylovora* was not affected by age, storage, kind of media, or serum globulin.

BROWN (J. G.) & BOYLE (ALICE M.). **Penicillin treatment of crown gall.**—*Science*, N. S., c, 2606, p. 528, 1944.

Crown galls of the soft type induced in *Bryophyllum* sp. by hypodermic inoculations with a pure culture of *Agrobacterium* [*Bacterium*] *tumefaciens* were cured by crude penicillin produced in the author's laboratory from an improved strain of *Penicillium notatum* [cf. *R.A.M.*, xxiv, p. 52]. The procedure adopted consisted in wrapping penicillin-soaked antiseptic cotton round the galls, frequently damping the cotton with crude penicillin, and puncturing the gall under the wrapping in numerous places with a sterile needle. Complete destruction of the galls resulted.

POSNETTE (A. F.). **Virus diseases of Cacao in Trinidad.**—*Proc. agric. Soc. Trin. Tob.*, xliv, 3, pp. 191–195, 3 figs., 1 diag., 1944.

This is a reprint of a paper already noticed from another source [*R.A.M.*, xxiii, p. 379].

POUND (F. J.). **Government's scheme for Cacao rehabilitation.**—*Proc. agric. Soc. Trin. Tob.*, xliv, 3, pp. 183–189, 1944.

In this interesting survey of the progress made in the scheme for the rehabilitation of cacao in Trinidad the author states that some of the seedlings obtained from seeds sent from the Amazon Valley in 1938, have so far shown no infection by witches' broom [*Marasmius perniciosus*: *R.A.M.*, xix, p. 391]. The best clone of two trees produced 130 pods in 1943, with no brooms as yet. In 1943, the author brought to Trinidad three budded plants of each of 32 trees found free from infection in the Amazon Valley [ibid., xxiii, p. 56]. These are now well established at River Estate. Some of the parent trees were free from disease in 1938, 1940, and 1942. The progeny have shown no sign of infection. Others were located in 1943, and three have had one small broom each; this, however, may be a juvenile character, and only temporary. Until the tests of the Amazon material have been completed, the only plants issued to planters will be susceptible but high-yielding selections; these must be planted only in suitable areas and not in those scheduled for a resistant cacao only.

NOSTI (J.). **La utilización de Heveas empleadas como árboles de sombra.** [The utilization of *Hevea* trees for the provision of shade.]—*Bol. agric. Terr. esp. Golfo de Guinea, 1943*, Part I, pp. 7–25, 2 pl., [? 1943. Received February, 1945.]

The most serious disease of *Hevea* rubber on the island of Fernando Po, where the tree is grown exclusively to provide shade in cacao plantations, is the root rot caused by *Fomes lignosus*. The fungus spreads from rubber to cacao and coffee in the vicinity and destroys them within a maximum period of two years. Other local hosts of the pathogen include bread fruit [*Artocarpus integer*], coco-nut, *Yucca*, and *Erythrina* spp.

Reports on diseases of cereal crops and grasses.—*Plant Dis. Reptr*, xxviii, 22, pp. 704–712, 1944. [Mimeographed.]

These reports and others in the same and subsequent issues contain numerous records of plant diseases occurring in the United States.

STRAIB (W.) & NOLL (A.). **Untersuchungen über den Einfluss der Hitze auf den Rostparasitismus.** [Investigations on the influence of heat on rust parasitism.] *Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 257–277, 1944.

In continuation of previous studies on the influence of temperature on rust parasitism, the authors investigated the effect of supramaximal temperatures on the course of infection and the external and histological reactions of wheat plants to yellow and brown rusts (*Puccinia glumarum* and *P. triticina*) [*R.A.M.*, xxii, p. 129]. The treatment consisted in the immersion of the plants for varying periods up to 24 hours in water heated to temperatures ranging from 25° to 50° C.

The outward manifestations of resistance, i.e., chlorosis and necrosis, increased in intensity with rising temperatures up to 35° in susceptible varieties immersed for uniform periods a few days after inoculation and then decreased. This response was induced after treatment for 16 hours, two hours, and one second at 25°, 30°, and 50°, respectively, while the fructification of both rusts was completely suppressed by immersion for 15 hours at 30°, ten minutes at 40°, and five seconds at 50° when the treatment was given five days after inoculation; with an earlier commencement these periods were correspondingly reduced. Heating of the wheat leaves before inoculation induced a temporary enhancement of susceptibility to both rusts, especially in such highly resistant varieties as Malakoff (to *P. triticina*) and Heine's Kolben and Carina (to *P. glumarum*), the most pronounced effects being obtained by 40 seconds' immersion at 50°.

High-temperature treatment of the plants after the establishment of rust infection causes the production of a wound gum-like substance round the mycelia [ibid., xxiii, p. 58 and next abstract], while another accompaniment of induced resistance is an incrustation of the host tissues with silicic acid. The adverse effects of heat on the pathogens are reflected in an inhibition of hyphal growth and deformation of the haustoria. A comparison of the microscopic features of *P. glumarum* and the cells of its host in cases of the so-called 'summer' or 'field' resistance revealed close analogies with those of the rust in seedlings with acquired resistance from heat 'shock'.

NOLL (A.). **Untersuchungen über Wundreaktionen des Weizenblattes und ihre Beziehungen zur Rostinfektion.** [Investigations on wound reactions of the Wheat leaf and their relations to rust infection.]—*Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 277–285, 1944.

The production in wheat leaf wounds of a substance resembling wound gum [see preceding abstract] is strongly favoured by a high degree of atmospheric humidity. At the optimum temperature of 30° C. the process is accomplished in 10 to 12 hours. The gum may be formed by the host cells in response to bacterial infection through an injury; after 20 seconds' heating at 50° it is no longer secreted and decay of the tissues sets in at the site of the wound. Wound gum production is further prevented by various other factors, such as frost, chloroform vapours, and infection by yellow rust (*Puccinia glumarum*). The cells in the vicinity of the injury are heavily incrusted with silicic acid. A number of analogies were observed to exist between the above-mentioned reactions of the host to injury and those developing as a sequel to rust infection, notably in respect of their relations to temperature.

HART (HELEN). **Stem rust on new Wheat varieties and hybrids.**—*Phytopathology*, xxxiv, 10, pp. 884–899, 4 figs., 1944.

Between 1939 and 1943 many of the wheat varieties and hybrids resistant to

stem [black] rust (*Puccinia graminis tritici*), which have been bred and distributed in increasing numbers in the United States since 1925, were grown at the Minnesota Agricultural Experiment Station to determine their capacity to withstand early and heavy inoculation with the parasite under variable environmental conditions. The test plots were surrounded by the susceptible Hard Federation variety, and the inoculum consisted mainly of physiologic races 10, 11, 15, 17, 21, 34, 36, 38, 49, 56, and 147. The experimental results are tabulated and discussed in the light of contemporary studies on varietal reaction to *P. g. tritici* and physiologic specialization within the rust.

Race 15B of *P. graminis* was identified in several collections from different parts of the United States. This race, though not one of the most prevalent, is particularly dangerous to most of the varieties and hybrids being bred for the Mississippi Valley, where the spring wheat varieties resistant to the now prevalent races are also susceptible to race 15B. Many of the breeding materials, such as Hope, the Kenya wheats, Jumillo durum, Vernal Emmer, and *Triticum timopheevi* are highly susceptible to race 15B, and most of the few wheats resistant to this race have certain undesirable characters, so that if the increased use of susceptible varieties should result in an increase in inoculum of race 15B the position might become serious.

CRAIGIE (J. H.). **Increase in production and value of the Wheat crop in Manitoba and Eastern Saskatchewan as a result of the introduction of rust resistant varieties.**—*Sci. Agric.*, XXV, 2, pp. 51–64, 1 map, 1944.

The benefit accruing to agriculture from the application of scientific research is vividly exemplified by the introduction of rust-resistant wheats in Canada. The bulk of the loss from stem rust [*Puccinia graminis*] in Western Canada has occurred in Manitoba and eastern Saskatchewan, but substantial loss has also occurred in occasional years in western Saskatchewan and Alberta. In the eleven-year period from 1925 to 1935 the average annual loss in the two first-named provinces of 35,518,000 bush. is estimated to have had a cash value of $30,784,000. In the epidemic year, 1916, the loss of yield in western Canada amounted to 100,000,000 bush. This loss in yield is not the whole loss. The grade of the crop is lowered by the rust. In 1916 this additional loss was about $64,000,000. The whole loss to western Canada from stem rust in that year is conservatively estimated at over $200,000,000. The growing of rust-resistant wheats began to influence wheat production in 1938 or 1939. In the next six years the farm income of Manitoba rose by about $9,500,000 a year and that of eastern Saskatchewan by $17,500,000 a year. This is not all. Besides attacking wheat, wheat stem rust attacks barley and it has been noticed that a great deal less infection develops on barley than was the case before rust-resistant wheats were introduced, owing to the amount of inoculum being greatly reduced. Some of these stem rust-resisting wheats are very susceptible to leaf rust [*P. triticina*], and a further, though not so large, gain would accrue if all the varieties grown were resistant to leaf rust as well as to stem rust. It is not only financially that the community is benefited, but there is also relief from one of those uncertainties which have the effect of frustration and insecurity.

Before 1916 apparently no money was spent on rust research and it is safe to say that the total amount spent since by the Government and all organizations does not exceed $2,000,000 and was probably much less. So that in a single year the improvement of farm income in the two areas mentioned exceeds 13 times all the expenditure ever made by Canada on wheat rust research. There is still scope for profitable expenditure. For example, rust-resistant varieties of barley should be developed. If Canada is to compete successfully as an exporter of farm products costs must be reduced, and this can only be done by scientific research.

GORDON (W. L.). **The occurrence of Fusarium species in Canada I. Species of Fusarium isolated from farm samples of cereal seed in Manitoba.**—*Canad. J. Res.*, Sect. C, xxii, 6, pp. 282–286, 1944.

During the six years, 1937 to 1942, isolations from 1,448 farm samples of seed of common wheat, 262 of durum wheat, 865 of barley, and 519 of oats produced in Manitoba yielded a total of 16 species, varieties, or forms of *Fusarium* [*R.A.M.*, xx, p. 353] representing seven sections of the genus. The most prevalent were *F. poae*, *F. equiseti*, and *F. scirpi* var. *acuminatum*; these three and *F. avenaceum*, *F. semitectum* var. *majus*, *F. culmorum*, *F. graminearum* [*Gibberella saubinetii*], and *F. oxysporum* were isolated from all four crops; *F. scirpi*, *F. sambucinum*, and *F. moniliforme* [*G. fujikuroi*] from common wheat, barley, and oats; *F. sporotrichoides* from common wheat and barley; *F. sambucinum* form 1 from common wheat and oats; *F. concolor* from barley; *F. scirpi* var. *compactum* from common wheat; and *F. sambucinum* form 6 from durum wheat. Species of *Fusarium*, one or more, were isolated from approximately 39 per cent. of the samples of common wheat, 38 per cent. of durum wheat, 55 per cent. of barley, and 58 per cent. of oats, but they were present only in small numbers in the seeds of each sample, e.g., in 0·66 per cent. of common wheat, 0·51 per cent. of durum wheat, 1·23 per cent. of barley, and 2·21 per cent. of oats. Individual species, varieties, or strains of *Fusarium* were isolated from less than 1 per cent. of the seeds of the four crops, with the exception of *F. poae*, which was isolated from 1·79 per cent. of the seeds of oats.

OXLEY (T. A.) & JONES (J. D.). **Apparent respiration of Wheat grains and its relation to a fungal mycelium beneath the epidermis.**—*Nature, Lond.*, cliv, 3922, pp. 826–827, 1944.

In studies conducted at Slough, respiration measurements made on wheat grain stored at 25° C. showed a progressive increase in the rate of carbon dioxide output over a period of several months, suggesting a progressive development of actively respiring tissue. As it has not been possible to detect any corresponding increase in the size or differentiation of the wheat embryo, it was concluded that the increased respiration rate of the grain is due almost entirely to micro-organisms which infect it. It was demonstrated that the carbon dioxide produced by the grain originates largely in the pericarp which contains few, if any, actively developing or even living cells, but was shown to contain abundant mycelium on the inner surface of the epidermis. The authors have so far been unable to identify any of the organisms present or to isolate them free from contamination. Further studies are stated to be in progress.

TAPKE (V. F.). **Evidence of hybridization between physiologic races of Ustilago hordei in passage through host.**—Abs. in *Phytopathology*, xxxiv, 11, p. 993, 1944.

Seed of Odessa (C.I. 934) barley, highly susceptible to races 3 and 6 of *Ustilago hordei*, was inoculated with a mixture of the two in equal proportions, and their relative contents in 25 of the resultant smutted heads determined by the artificial infection of differential hosts. Fifteen of the diseased heads contained only race 3, one only 6, seven a mechanical mixture of both, and two a different race, apparently arising through hybridization and capable of attacking varieties immune from 3 and 6. The 'synthetic' race is evidently not a new one, since the reactions induced by it on the differential barley varieties resemble those called forth by a spontaneously occurring race. Only a few of the further selections of the hybrid in subsequent generations lost the ability to infect varieties immune from races 3 and 6.

PETURSON (B.). **Adult plant resistance of some Oat varieties to physiologic races of crown rust.**—*Canad. J. Res.*, Sect. C, xxii, 6, pp. 287–289, 1944.

It was observed during recent years that the new oat varieties Erban, Ajax,

and R. L. Nos. 1370 and 1510, although completely susceptible in the seedling stage to all the physiologic races of crown rust (*Puccinia coronata* var. *avenae*) [*R.A.M.*, xxiii, p. 330] that occur in Canada, possess in the adult stage a considerable degree of resistance to this rust under field conditions. The adult plant resistance of Erban was particularly marked in eastern Canada and less evident in the west; Ajax was generally more resistant than Erban in western and less resistant in eastern Canada. In inoculation experiments designed to determine the reactions of these oats to races 1, 2, 3, 4, 5, 6, and 38 of the rust, all the varieties tested were found to be susceptible to all the seven races in the seedling stage. In the adult stage, Erban was quite susceptible to races 1, 4, and 5 but resistant to 2, 3, 6, and 38; Ajax was susceptible to race 5, moderately resistant to races 2 and 3, and highly resistant to races 1, 4, 6, and 38; and R. L. Nos. 1370 and 1510 were highly resistant to all the seven races. Plants of the varieties that showed adult plant resistance were not uniformly resistant throughout, the upper leaves usually showing the least and the lower the most resistance. It is concluded from these results that some oats, of which Victoria, used in the present study as control, is a typical example, possess practically no adult plant resistance, others are resistant to some but not to all races, and still others are resistant to most.

DILLON WESTON (W. A. R.). **Leaf spot of Oats.**—*J. Minist. Agric.*, li, 11, pp. 512–514, 1 fig., 1945.

This brief, popular note on oat leaf spot (*Helminthosporium avenae*), like the earlier papers in this series [*R.A.M.*, xxiv, p. 132], is illustrated by a chart depicting the life-cycle of the fungus.

KINGSOLVER (C. H.). **Pathogenicity on Avena and growth response of Pseudomonas coronafaciens (Elliott) Stapp.**—*Iowa St. Coll. J. Sci.*, xix, 1, pp. 29–31, 1944.

In a study conducted from 1940 to 1942, inclusive, *Pseudomonas coronafaciens* [see next abstract] was observed to attack species and varieties of *Avena* from the time the seed coat ruptured until the plant reached maturity. In some infected seeds the plume was completely destroyed and the radicle remained underdeveloped. Occasionally, the whole seed, except the lemma and palea, was so rotted that, on pressure, a yellowish-white viscous material was extruded. Plumule necrosis varied in severity. On the leaves the symptoms appeared as tiny, water-soaked spots 1 mm. or less in diameter, which became the centres of lesions showing yellow, halved areas, rapidly turning brown and becoming confluent or assuming a concentrically ringed appearance. Variety effect on symptoms was expressed as variation in colour, size, and number of lesions and definitions of concentrically ringed or confluent appearance. The lesions on the leaf sheaths were elongate, yellowed, confluent areas commonly without the concentrically ringed appearance. Lesions on culms and glumes were observed infrequently.

Many isolations were made from oat-leaf lesions of suspected bacterial origin. The lesions varied widely in size, shape, colour, and amount of halo, and differed in type with the host variety. Isolates from linear lesions with observable exudate were designated *P. striafaciens*; these did not differ in cultural reactions from *P. coronafaciens*. Isolations of *P. coronafaciens* var. *atropurpureum* from *Bromus inermis* were culturally similar to *P. coronafaciens*, except that they produced fluorescence in beef-peptone broth and showed a rather more rapid growth; they were pathogenic to oats. Cultural studies of 54 isolates of *P. coronafaciens* obtained from 1940 to 1942 showed that the organism present on oats in Iowa in these years essentially resembled the organism described by Elliott. Clearly defined cultural strains of *P. coronafaciens* could not be established.

Oat varieties experimentally infected by seed inoculation with *P. coronafaciens*, using a special technique, showed striking increases in pre-emergence mortality

and in disease severity on the surviving seedlings. Degree of varietal susceptibility changed with the test conditions. The behaviour most nearly resembling the field leaf reaction occurred at 70° F. At 50° separation of the disease injury into two categories was apparent, particularly in tests with hulled seed. The severity of the disease on the leaves agreed in general with field leaf reactions. Pre-emergent killing appeared to be relatively unrelated to severity of leaf symptoms. This seed infection method of inoculation appears to be of real value in estimating varietal response in oats to attack by *P. coronafaciens*.

The organism appears to be more prevalent and destructive on oats in Iowa than has so far been realized. Seedling injury and death may play a considerable part in the reduction of stands and the provision of inoculum for subsequent spread. The range of leaf symptoms studied permits the inclusion of halo blight of several types of leaf injury not before attributed to *P. coronafaciens*.

Field work showed that the oat varieties Boone, Marion, Hancock, Erban, Anthony, Mutica Ukraina, Gopher, and Landhafer, with selections from crosses between them, were in general susceptible to halo blight. Victoria × Richland selections were mostly intermediate, selections with Bond as a parent were mostly comparatively unaffected, and D-69 × Bond selections, as a group, were outstandingly resistant.

GORLENKO (M. V.) & NAYDENKO (A. I.). **Bacterial leaf spot of Oats caused in the USSR by Bacterium coronafaciens Ell.**—*C. R. Acad. Sci. U.R.S.S.*, N. S., xlii, 8, pp. 365–368, 1944.

A bacterial leaf spot of oats investigated during 1940 at the Voronezh Station for Plant Protection and during 1941 at the Laboratory for bacterial diseases at the Moscow Station, was identified as *Bacterium* [*Pseudomonas*] *coronafaciens* [*R.A.M.*, xxiii, p. 330 and preceding abstract]. The disease, which is stated to be widely distributed in the Soviet Union, occurring as far north as the Cola peninsula, becomes visible soon after the appearance of sprouts in the form of watery spots on young oat leaflets. These spots later dry up and turn reddish, the whole leaf blade ultimately dying away. On adult leaves the spots are large and diffuse, angular, brown-red with a lighter centre. They start at the edge but frequently cover the entire blade. The pathogenicity of the organism to oats was demonstrated by means of artificial infection of injured leaves; in three different field experiments in three localities in 1940 and 1941, 100 per cent. infection was obtained after an incubation period of two to three days. The bacterium failed to infect barley, wheat, or rye. Seed collected from badly infested plots was found to account for only 2 to 3 per cent. of diseased plants in the subsequent crop; percentages up to 34·8 occurred, on the other hand, in fields situated next or near to past season's infested plots. It is concluded from these facts that the main source of infection is last season's plant remains. The disease is further spread by rain and wind.

PEPPER (B. B.) & HAENSELER (C. M.). **Control of European Corn borer and ear smut on Sweet Corn with dusts and sprays.**—*Circ. N. J. agric. Exp. Sta.* 486, 14 pp., 1944.

After giving directions for the control of the European corn borer (*Pyrausta nubilalis*), the authors state that in New Jersey maize smut due to *Ustilago zeae* [*R.A.M.*, xxiii, p. 60] is the most destructive disease of this crop. On some early varieties it is frequently a major factor in determining profits and losses. In nearly every field a reduction of 5 per cent. in sweet corn crop due to smut is to be expected, and losses of 10 to 15 per cent. are very common. On some highly susceptible hybrids, 20 to 30 and occasionally over 60 per cent. of the ears are destroyed by the fungus.

Locally, when the corn is harvested for the green corn market, nearly all the smut

boils are left on the field to be disked or ploughed into the soil, in which the spores may remain dormant for a year or more, until maize is planted again. The spores may also be blown to other fields, with the result that the disease may occur in a field not planted to maize in recent years and remote from other maize fields. The disease may vary in intensity from year to year, sometimes causing little damage, sometimes much.

No satisfactory control methods are as yet available, but such practices as careful field sanitation, crop rotation, the use of resistant varieties, and a proper choice of maturity date have given partial control in some instances. The removal and destruction of all smut boils before they break and avoiding manures containing spores may prove helpful in small isolated fields and home gardens, but in commercial sweet corn areas such measures would probably have to be practised on a community basis to be of use. A four- to five-years' rotation helps, provided no contaminated manure is used and spores are not blown into the fields. No high quality, early, resistant varieties, suitable for New Jersey conditions, are available at present.

Early-planted sweet corn often shows heavier infection than later plantings, but this does not always hold. The weather in New Jersey is so variable that planting on any particular date does not offer much prospect of success. The growth rate and vigour of the plants, as affected by soil, climatic, and nutritional conditions, also affect the likelihood of infection, but well-nourished, rapidly growing plants are those most susceptible to attack.

Observations showed that the use of sprays and dusts against the European corn borer also reduced smut, marked reduction of infection occurring when dusts containing rotenone or nicotine as the active agent were used. Three formulae gave very good results: (*a*) finely ground derris or cube root (containing 5 per cent. rotenone) 20 lb., dusting sulphur 25 lb., wetting agent 2 oz., and talc or clay 55 lb.; (*b*) nicotine-bentonite concentrate (containing 14 per cent. nicotine) 28 lb., dusting sulphur 25 lb., walnut shell flour or talc 47 lb., and wetting agent 2 oz., and (*c*) finely ground derris or cube root (5 per cent. rotenone) 10 lb., nicotine-bentonite concentrate (14 per cent. nicotine) 14 lb., dusting sulphur 25 lb., wetting agent 2 oz., and talc or clay 51 lb. When rotenone and nicotine are used together, sulphur must be added. In formulae (*a*) and (*b*), however, the sulphur may be omitted, and an equal quantity of the inert carrier added, but smut control is better when the sulphur is used. Most of the smut control tests were conducted with the first formula.

As a rule, dusting was effected at intervals of five days, beginning about ten days before the first silks appeared, and ending five to seven days after silking started. Applications before the silks appeared were more effective in preventing ear infection than later ones. Power- and hand-dusters gave equally good results when the dust was directed downwards into the top whorl of the young plant, so that the dust settled on the tops of the leaves near the stalk and passed into the leaf sheaths of the older leaves.

In many tests over a period of four years, control never fell below 33 per cent., and most of the treated plots had only 20 to 50 per cent. as many infected ears as the controls. In a few instances, where the disease was not severe, the dusted plots showed no infection. As a rule, when untreated maize showed 30 to 50 per cent. infection, dusting gave 50 to 60 per cent. control, and when only 5 to 10 per cent. infection was present on untreated maize it gave 80 to 100 per cent. control.

Further work is being carried out to ascertain why rotenone and nicotine have proved so effective in smut control.

Leukel (R. W.), Martin (J. H.), & Lefebvre (C. L.). **Sorghum diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1959, 46 pp., 27 figs., 1 diag., 1944.

In this valuable compilation the authors summarize the latest available informa-

tion on sorghum diseases in the United States and give directions for their control by rational cultural methods and seed treatment with a standard fungicidal dust. Attention is drawn to the use of the crop as an adjunct in alcohol manufacture and the brewing industry.

HEYNE (E. G.), MELCHERS (L. E.), & LOWE (A. E.). **Reaction of F_1 Sorghum plants to Milo disease in the field.**—*J. Amer. Soc. Agron.*, xxxvi, 7, pp. 628–630, 2 figs., 1944.

Male-sterile Western Blackhull sorghum plants, resistant to milo disease [chiefly *Pythium arrhenomanes*: *R.A.M.*, xxiii, p. 101], were crossed with the susceptible Darso in 1941 and 1942, the F_1 progeny and parents being grown in the greenhouse each winter, and in 1943 in the field on infested soil at the Garden City Branch of the Kansas Agricultural Experiment Station [ibid., xvi, p. 807]. The hybrid reactions were found to vary according to the environment in which the plants are grown. Thus, under optimum conditions for infection in the greenhouse, the disease appeared early and eventually killed the F_1 plants, although they lived much longer than the susceptible parents. In the field, the development of infection is slower, and the symptoms generally less severe; they may, however, be readily observed on the roots and crown, which were not obviously affected in the resistant parents.

An apparent reversal of dominance, therefore, is merely a shift in expression of disease intensity due to environment. On the basis of these studies, the hybrid population may be divided into three classes: susceptible, intermediate, and resistant.

MOTZ (F. A.). **The fruit industry of Argentina.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 1, 102 pp., 39 figs., 1 map, 1942. [Photo-lithographed. Received January, 1945.]

This report contains much valuable information on various aspects of the production and marketing of deciduous and citrus fruits in Argentina, including the measures in operation for pest and disease control [cf. below, p. 152]. The most serious problem confronting citrus-growers in Corrientes and Misiones is the 'poor rootlet' disease associated with incompatibility between the sweet orange scions and the sour orange stocks [cf. *R.A.M.*, xxiii, p. 484]. This combination is believed by local plant pathologists to encourage a deep-rooting system, the root hairs developing in the subsoil and coming into contact with an excess of toxic salts and moisture, which result in their decomposition. A similar trouble began in 1938–9 to affect grapefruit on rough lemon stocks. In the Pindapoy district, 11,000 grapefruit and 35,000 orange trees were estimated to have succumbed to the disease.

Spraying against the other economically important citrus diseases, gummosis [*Phytophthora parasitica* and *P. citrophthora*] and scab [*Elsinoe australis*], is not effectively carried out, some growers making one or two applications and others none.

CHILDS (J. F. L.) & SIEGLER (E. A.). **Experimental control of Orange decays with thiourea.**—*Phytopathology*, xxxiv, 11, pp. 983–985, 1944.

In tests *in vitro* with thiourea [*R.A.M.*, xviii, p. 136] dissolved in maize meal agar, the growth of *Diplodia natalensis* was inhibited between 0·1 and 0·2 per cent. and that of *Phomopsis* [*Diaporthe*] *citri* and *Penicillium digitatum* between 0·01 and 0·02 per cent. Concentrations of thiourea ranging from 10 to 0·1 per cent. were tested in several experiments on oranges. Approximately 50 per cent. control was obtained with 1 per cent. concentration and over 90 per cent. at 4 per cent. A 2 per cent. concentration was only slightly less effective and a 10 per cent. concentration not significantly more effective than a 4 per cent. concentration.

Trials were also carried out to determine the effect of washing or brushing the fruit after dipping on the fungicidal action of thiourea. Fruits dipped in a 5 per cent. solution, on which the chemical was allowed to dry before washing, remained sound; in those washed while still wet the incidence of decay amounted to 19 per cent. as against 44·6 in the controls. In treated fruits dried while still wet by means of revolving brushes there was 10 per cent. rot compared with 43·3 per cent. in the untreated. In one test on 80 dipped fruits, complete control was secured by air-drying after brushing.

In two experiments with Valencia oranges exposed for 40 and 42 hours to ethylene gas vapours and coated in a proprietary wax emulsion to prevent wilting, there was 2·4, 1·2, and 34·5 per cent. decay after 18 days' storage in the lots treated with (*a*) 5 per cent. thiourea alone, (*b*) the same emulsion, and (*c*) controls, respectively.

LING (L.) & YANG (JUHWA Y.). **Studies on the biology and pathogenicity of Colletotrichum indicum.**—*Ann. Bot., Lond.*, N. S., viii, 29, pp. 91–104, 2 figs., 4 graphs, 1944.

Cotton cotyledons and bolls showing symptoms resembling those of anthracnose (*Glomerella gossypii*) at Chengtu, Szechwan Province, western China, in 1938 yielded a fungus which was identified, on the basis of its morphological and physiological characters on the host and in potato dextrose agar cultures, as *Colletotrichum indicum* [*R.A.M.*, xiii, p. 508]. In nature the acervuli measure 27 to 124μ in diameter, and the falcate conidia with obtuse ends, 16·5 to 27·5 by 3 to 5μ. The dark brown, uni- to tri-septate setae, ranging from 40 to 216 by 3 to 7·7μ, are produced at an early stage of growth on the stroma, mostly intermingled with the hyaline, cylindrical, simple conidiophores, 5·5 to 15·1 by 1·9 to 4·1μ. The dimensions of the same organs in pure culture are as follows: acervuli 36 to 184μ, conidia 19·3 to 33 by 2·8 to 4·4μ, setae 69 to 399 by 3·3 to 9·1μ, and conidiophores 8·3 to 34·4 by 1·9 to 3·3μ.

The optimum temperature for the germination of the conidia was about 32° C. and for the growth of the fungus on the agar medium 28°. Conidial germination and mycelial development were most profuse at P_H 5·4 and 5·4 to 7·6, respectively. The conidia proved very susceptible to desiccation, which they withstood for less than 24 hours.

Inoculation experiments were successful both on Chinese varieties of *Gossypium arboreum* and on *G. hirsutum* (Delfos 531 and Trice) of American origin. Seed immersion in conidial suspensions of *C. indicum* resulted in a high percentage of diseased seedlings, while spraying the young plants with the same material induced dark green, later greyish-brown lesions on the cotyledons, stems, leaves, and detached bolls. In 1938, inoculated seed in sterilized soil produced 100 per cent. diseased plants of *G. arboreum* and 67·3 per cent. Trice, the corresponding figures for 1941 being 84·4 and 61·4 (for Delfos 531), respectively. When germination trays were used in 1941, 46·6 per cent. of the plants from inoculated local seed became infected and 41 per cent. were killed, the corresponding figures for Delfos 531 being 39·5 and 29 per cent., respectively. All the controls in both series of tests remained healthy. Chilli (*Capsicum annuum* var. *grossum*), tomato, and egg-plant fruits, and soy-bean and cowpea pods were also inoculated with positive results, but the seedlings were not attacked.

Overwintering takes place chiefly within the diseased seeds, and possibly in the infected host refuse left in the field. Fairly high temperatures combined with very humid conditions promote the development of *C. indicum*, the latter factor being of great importance in Szechwan. Not only do rainy or cloudy periods assist the germination and dissemination of the conidia, but they prevent the desiccation of the mucilaginous matrix, thereby affording increased chances for the survival of the infective material.

VANNAH (H. P.), RAY (C.), & WOLF (F. A.). **Sclerotial disease of Flax caused primarily by Sclerotinia sclerotiorum (Lib.) Massee.**—*J. Elisha Mitchell sci. Soc.*, lx, 2, pp. 99–108, 5 pl., 1944.

In the summer of 1943, flax growing near Haltville, California, was found to have lodged and to show stem-break; *Sclerotinia sclerotiorum*, not previously recorded on this host in the United States, was abundantly present inside the stems in its mycelial and sclerotial states. The most conspicuous symptom in the field was the occurrence of patches of lodged and broken plants. The affected stems when bent either became completely severed or only the axial elements broke, the top portion remaining attached to the plant by strands of fibre and dangling. The broken-off parts made up two-thirds or more of the stem length. The affected stems were usually paler than healthy ones. Of even better diagnostic value was the presence of one per cm. of stem length of hard, black, cylindrical sclerotia within the pith cavity. The stature of the diseased plants was smaller than that of normal ones, the root systems were impaired by the death and decay of the smaller roots, and the yield of seed was reduced. The seed from affected plants was sometimes less plump than that from normal ones.

When healthy flax seeds were planted in pots of artificially infected soil, the seedlings succumbed to infection, and the fungus was recovered in pure culture. In similar tests, *Polyspora lini* and *Sphaerella linorum* were less destructive. Sclerotia from potato dextrose agar cultures of *Sclerotinia sclerotiorum* were placed in moist sand at 70° F. and produced apothecia in about six weeks.

By inducing changes in flax tissues, the disease affects both the yield and the quality of the fibre. In one test in which a 92 gm. sample of straw from an infected crop was decorticated according to the method used in preparing flax for the manufacture of cigarette paper, 31 gm. of tow were extracted, containing 39·44 per cent. of pure fibre which was short and weak. Assuming that half the sample consisted of diseased straw, the yield of chemically treated fibre was 12·63 per cent. as against 15·3 per cent. for a similar sample of normal straw. The per cent. fibre of a completely diseased sample was 9·96. The efficiency of recovery of fibre in mechanically decorticating the straw, probably half of which was infected, was 60·5 per cent. whereas that from normal straw invariably approximates to 85 per cent.

MCCLELLAN (W. D.) & STUART (N. W.). **The use of fungicides and growth substances in the control of scale rot of lilies.**—*Phytopathology*, xxxiv, 11, pp. 966–974, 3 figs., 1944.

The bulb scales of two *Lilium longiflorum* clones and *L. testaceum*, which are known to be very susceptible to the rot caused by *Fusarium oxysporum* f. *lilii* Imle (*Amer. Lily Yearb., 1942*, pp. 30–41, 1942) [cf. *R.A.M.*, xxii, p. 434], and those of a mixture of more resistant Easter lily clones were treated with some or all of the fungicides ceresan, arasan, fermate, zincate (zinc dimethyldithiocarbamate, R. T. Vanderbilt Co.), spergon, and formaldehyde and planted for four to six weeks on a greenhouse bench under moist sphagnum. Coatings of arasan and spergon (2 oz. per 60 and 100 lb. scales, respectively), conferred very satisfactory protection, the former being preferable for the very susceptible varieties. Ceresan (1 lb. in 40 gals. water, two minutes' immersion) also proved to be an effective fungicide, but inhibited bulblet production unless arasan was applied after the ceresan. Fermate and zincate did not give adequate control of the pathogen, and formaldehyde damaged the scales.

Combinations of arasan and spergon with the growth substances, indolebutyric acid and naphthaleneacetic acid, at the rate of one part of the growth substances to 500 of the fungicidal carrier, resulted in heavier rooting and more bulblets than did either alone, arasan being superior to spergon and naphthaleneacetic to indolebutyric acid.

JENKINS (ANNA E.). **Oedema of cultivated Violet identified as scab.**—Abs. in *Phytopathology*, xxxiv, 11, p. 992, 1944.

From her recent examination of a specimen of the so-called 'oedema' of sweet violets collected by B. T. Galloway at Garrett Park, Maryland, the author is convinced that the disease described under this name in 'Commercial Violet Culture' (1889) is identical with scab (*Sphaceloma violae*) [*R.A.M.*, xxiv, p. 60]. The leaf and petiole symptoms of the two conditions correspond, and scrapings from the 'oedema' lesions yielded hyphae and conidia agreeing with those of *S. violae*. At the time when 'oedema' was causing trouble in Maryland, the same disease was rife in the Hudson, according to information supplied to the writer by a retired grower from that region, who, like Galloway, specified poor aeration, excessive moisture, and cold as predisposing factors. As shown by previous reports, scab has been more or less prevalent on native wild violets in the District of Columbia, and in 1935 it was observed in profusion on a wild form growing luxuriantly in a glade in Rock Creek Park, Maryland, i.e., in the same stream valleys as at Garrett Park. Galloway's description and specimen may now be accepted as the first record of *S. violae*.

JONES (L. K.). **Streak and mosaic of Cineraria.**—*Phytopathology*, xxxiv, 11, pp. 941–953, 4 figs., 1944.

Greenhouse cinerarias (*Senecio cruenta*) in the State of Washington suffer from two virus diseases, streak and mosaic [*R.A.M.*, xxii, p. 240], of which the former is particularly destructive, causing leaf and stem necrosis and wilting of the plants towards flowering time, with a resultant loss of 20 to 50 per cent. Mosaic causes a mottling, puckering, and malformation of the leaves and dwarfing of the plants. Though widely distributed, it is not very prevalent, affecting only 2 per cent. of the plants, for instance, in one of the houses visited in 1938, and except in severe cases does not materially lower the sale of the plants. The streak virus is transmissible through the seed, by mechanical contact between diseased and healthy tissues, and by *Thrips tabaci*, but is rapidly inactivated in extracted plant juice. It was transmitted to tomato and peas, the symptoms on which, together with other characters of the virus, point to its being a strain of the tomato spotted wilt virus. The mosaic virus is also transmissible through the seed, by mechanical inoculation methods, and by *Aphis marutae*, but, unlike streak, it failed to infect any of the other plants tested and is therefore presumably specific to its own host. Its thermal death point lies near 70° C. and it persists in extracted plant juice for a fortnight.

Control measures should include the selection of healthy plants for seed production, the extermination of the insect vectors, weed destruction, and care to avoid the handling of infected plants before attending to sound ones.

DIMOCK (A. W.). **Hot-water treatment for control of Phytophthora root rot of Calla.**—*Phytopathology*, xxxiv, 11, pp. 979–980, 1 fig., 1944.

The successful use of hot water against *Pythium* root rot of *Aloe variegata* [*R.A.M.*, xxiii, p. 21] suggested the application of a similar treatment to Calla lily (*Zantedeschia* sp.) rhizomes infected by *Phytophthora richardiae* [ibid., xii, p. 26], and 15 of these were accordingly soaked for one hour in water heated to 50° C. on 8th November, 1943, two days before planting in sterilized soil. On 17th March, 1944, the foliage and roots of all the treated plants were perfectly sound, whereas those of the 15 controls were completely decayed. These results indicated that hot water may serve as an effective substitute for chemical disinfectants against *P. richardiae*, a further advantage of the former consisting in the absence of any deleterious influence on sprouting or flowering.

MENZIES (J. D.). **Transmission studies with Alfalfa witches'-broom.**—Abs. in *Phytopathology*, xxxiv, 10, p. 936, 1944.

The symptoms of witches' broom of lucerne appear in the stock two months after shoot-grafting and in five to six months where root-grafting is practised [*R.A.M.*, xxii, p. 240]. The disease was transmitted by the former method to *Medicago lupulina* and *M. hispida*. The leaf-hopper *Platymoideus acutus*, which is widespread throughout the United States and Canada, was experimentally shown to be capable of conveying the virus from infected to healthy plants.

ARK (P. A.). **Bacterial blight of Purple Vetch caused by Phytomonas pisi.**—Abs. in *Phytopathology*, xxxiv, 10, p. 933, 1944.

Purple vetch (*Vicia atropurpurea*) and Canadian field peas in a field covering several acres in Sonoma County, California, were severely attacked by *Phytomonas* [*Pseudomonas*] *pisi*. On the former, infection frequently originated at the middle of the stem and spread rapidly downwards, killing the plants. Occasionally, however, only the tips were blighted, the progress of the disease probably being arrested by a rise in temperature. Isolates from both hosts infected peas, and greenhouse cross-inoculation experiments gave positive results.

FISCHER (G. W.). **The blind-seed disease of Ryegrass (Lolium spp.) in Oregon.**—Abs. in *Phytopathology*, xxxiv, 10, pp. 934–935, 1944.

Perennial rye grass (*Lolium perenne*) seed germinated very poorly in sections of the Willamette Valley, Oregon, in 1942 and 1943 owing to infection by *Phialea temulenta* [*R.A.M.*, xxiii, p. 230], the apothecia of which were found in profusion both on the species in question and *L. temulentum*, while a few were also harboured by old seeds of *Hordeum gussoeanum*. The conidial state of the pathogen was detected on *Agrostis exarata* var. *monolepis*, *Aira caryophyllea*, *Alopecurus geniculatus*, *Bromus racemosus*, *Cynosurus echinatus*, *Deschampsia caespitosa*, *Danthonia californica*, *Festuca elatior*, *F. myuros*, *Glycena borealis*, *H. gussoeanum*, *Holcus lanatus*, and *Phleum pratense*.

A modification of the New Zealand method for the qualitative and quantitative estimation of blind seed in currant crops of *L. perenne* and in seed samples is now being tested. Random head samples are chopped and soaked for a short time in water, which is then strained through a cheesecloth and centrifuged. The residue is then examined microscopically for the conidia of *Phialea temulenta*, the incidence of which expresses the severity of blind seed in a given field. No apothecia were found where low-germination (53 per cent.) seed was planted in the spring, whereas autumn-sown seed of the same lot yielded an average of 6·8 of the fruit bodies per sq. ft. in the following spring.

MCKINNEY (H. H.). **Studies on the virus of Brome-grass mosaic.**—Abs. in *Phytopathology*, xxxiv, 11, p. 993, 1944.

The end point of brome grass mosaic virus [*R.A.M.*, xxi, p. 371] activity in extracts from the host is ten minutes at 78·5° C., near 10^{-5} when diluted with water, and in dry leaf tissue at laboratory temperatures beyond 306 days. Grass hosts include wheat, rye, barley, oats, sorghum, Johnson grass [*Sorghum halepense*], Sudan grass, teosinte [*Euchlaena mexicana*], maize, and other annual and perennial species in nine tribes. Inoculation experiments were performed with the aid of carborundum. In maize seedlings at the two- to three-leaf stage, at high growing temperatures, the first reactions develop 36 to 40 hours after inoculation, the reactions comprising chlorosis, necrosis, and the death of the host. In other grasses the responses to infection range from carriers showing no perceptible symptoms to mild or severe chlorotic mottling or streaking. Natural resistance in the host increases rapidly with advancing age. In Scotia bean the first infected leaves bear small,

local, necrotic lesions, while Early White Spine cucumber cotyledons and Samsun tobacco leaves develop a faint, chlorotic spotting; a local increase of virus occurs in each host.

MOTZ (F. A.). **The fruit industry of Chile.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 3, 46 pp., 9 figs., 1 map, 1942. [Photo-lithographed. Received January, 1945.]

This useful digest of the available information concerning the Chilean fruit industry contains a section on pest and disease control, from which it appears that climatic conditions are not, on the whole, particularly conducive to parasitic development. Most growers are equipped with spraying outfits, and in general, the results of plant-protective treatments are satisfactory, but powdery mildew has assumed a rather serious form on stone fruits which requires a more extensive programme than the one dormant application commonly given. Apple and pear scab [*Venturia inequalis* and *V. pirina*] may also give trouble in the southern part of the Central Valley, and here again more attention to the spraying schedule is indicated, only half the recommended number of six to nine treatments being actually applied.

MOTZ (F. A.) & MALLORY (L. D.). **The fruit industry of Mexico.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 9, 184 pp., 120 figs., 1 graph, 9 maps, 1944. [Photo-lithographed.]

Included in this valuable, fully tabulated survey of various facets of the Mexican fruit industry is an interesting account of the banana 'Sigatoka' disease [*Mycosphaerella musicola*: *R.A.M.*, xviii, p. 192]. This is stated to have been the decisive factor in the collapse of banana production, coinciding as it did with two other contributory causes, namely, the Government expropriation of land and agrarian troubles. The disease was first observed in Mexico in 1937. Production for the country fell from 525,000 metric tons in 1937 to 240,000 in 1941, when exports from Tabasco (the first State to be affected) ceased entirely. Chiapas was the first State to inaugurate in 1941 a successful spraying campaign, subsidized by the semi-governmental Banco de Comercio Exterior, and by the end of 1942 the position had undergone a considerable improvement, reflected in the expansion of foreign and domestic markets. At this time 100 carloads were leaving the State weekly compared with 30 at the beginning of the same year, but even so, the 26 exporters constitute only a small percentage of all persons engaged in the banana industry. The life-cycle of the pathogen necessitates the application of Bordeaux mixture at three-weekly intervals during the rainy season, and the Bank's instructions prescribe 14 annual treatments, the number actually given, however, averaging nearer 11. Two sizes of spraying machines are available with tank capacities of 300 and 150 gals. and potential top pressures of 600 and 400 lb., respectively, the average used approximating to 300. In January, 1943, some 460,000 mats, covering 1,340 ha., were being sprayed regularly at an average dosage of 5 l. per mat per treatment, and the Bank was contemplating the provision of additional equipment and chemicals for the protection of 300,000 more mats. In 1942 a total of 462 metric tons copper sulphate was imported into Chiapas for this purpose, nearly all from the United States.

Foot rot [*Phytophthora parasitica* and *P. citrophthora*], scaly bark [psorosis], anthracnose, and melanose [*Diaporthe citri*] are the principal citrus diseases. In general, they are not sufficiently virulent to threaten the loss of groves or markets, and therefore the majority of growers have taken no active steps to organize effective control.

Experiments are reported to be in progress on the development of a pineapple variety resistant to *Thielaviopsis* [*Ceratostomella*] *paradoxa*.

Quinces are grown on a fairly large scale in the State of Coahuila, where fireblight

[*Erwinia amylovora*] appeared 10 or 12 years ago, and some severe cases of crown gall [*Bacterium tumefaciens*] have been observed. Fireblight, though of slight importance on the quince, is destructive to pears, the cultivation of which, in fact, is rapidly declining from this cause. The supply of fresh deciduous fruits on Mexican markets being far short of the demand, appearance and grade defects are not determining factors in their saleability. Moreover, the cost of imported fruit is prohibitive, and domestic products are therefore widely distributed at an attractive price. There are no recommended spray schedules for the country.

MONTGOMERY (H. B. S.) & WORMALD (H.). **Silver leaf and papery bark in Apple trees.**—*Rep. E. Malling Res. Sta., 1943*, pp. 51–52, 1944.

To ascertain whether papery bark of top-grafted apple trees was entirely due to cutting-back, or whether it was associated with silver leaf (*Stereum purpureum*) [*R.A.M.*, xxiii, p. 27], an experiment was carried out in which nine five-year-old Newton Wonder apple-trees were cut back to different levels, three having the whole head removed, three having all the branches cut back to about 6 in. of the crotch, and three having only one branch so cut. Two trees in each set were inoculated on the cut ends on 18th May, 1943, and the remaining tree used as a control.

The control trees all produced healthy shoots, but the tree with the entire head removed and that with all the branches cut back showed (in winter) papery bark for 2½ in. and 2 in., respectively, while that with only one branch cut back presented no papery bark. The inoculated trees all developed infection, severity depending on the extent of the cutting-back. Trees with the heads completely removed and those with all the branches cut back all showed, in summer, pronounced silver leaf and some papery bark just below the cuts; in winter, papery bark was present along the entire stem, and there were many fructifications of *S. purpureum* from the crotch to ground-level. In the two inoculated trees with only one branch cut back, there was no papery bark in summer and only a trace of silver leaf on one; in winter they showed papery bark for 2 in. below the cut surface.

It is concluded that severe cutting-back was an important predisposing factor in causing papery bark, and that while the condition was produced to a very slight extent in the absence of *S. purpureum* it was much more conspicuous and extensive where hard cutting-back was combined with infection through the cut surface. These results confirm the view that the risk of loss from grafting as a result of papery bark and silver leaf in apple-trees can be reduced by frame-working instead of top-grafting when converting one variety of apple tree to another.

CRANE (M. B.). **Origin of viruses.**—*Nature, Lond.*, clv, 3926, pp. 115–116, 1945.

Two abnormalities have recently been noted in the Lord Lambourne apple variety when grafted on to certain others: lack of rigidity in the branches and growth, and reduction in fruit size to about one-quarter of the normal. The behaviour of these abnormalities suggests that they are of a virus nature and have arisen directly by grafting [cf. *R.A.M.*, xxiv, p. 48].

KEYWORTH (W. G.). **Verticillium wilt of Plum.**—*Rep. E. Malling Res. Sta., 1943*, pp. 52–54, 2 figs., 1944.

From a wilted six-year-old Victoria plum tree growing on a fruit and hop farm in Kent the author isolated *Verticillium albo-atrum* [cf. *R.A.M.*, vii, p. 179]. The fungus appeared to be morphologically identical with isolates obtained from hops on the same farm affected with *Verticillium* wilt. Infection had apparently originated from wilted hop bines placed round the base of the tree eleven months before.

BOTTOMLEY (A[VERIL] M.). **Peach and Apricot freckle.**—*Fmg S. Afr.*, xix, 225, pp. 762–763, 1 fig., 1944.

Peach and apricot freckle (*Cladosporium carpophilum*) [*R.A.M.*, xxiii, pp. 251,

475] occurs throughout the Union of South Africa, where it is most severe in the summer-rainfall areas. It attacks late varieties of peach and apricot mostly, but occasionally affects nectarines and plums. The fruit, leaves, and young twigs may all become infected, but the disease is conspicuous only on the fruits, which may be so disfigured as to be unmarketable and useless.

The most effective control consists in spraying three to four weeks after petal-fall, three weeks later, one month after the first treatment, and then at monthly intervals until maturity with wettable sulphur (5 to 6 lb. per 100 gals. water), dry-mix lime-sulphur (20 lb. sulphur, 10 lb. hydrated lime plus $1\frac{1}{4}$ lb. dry calcium caseinate mixed to a paste and added to 100 gals. water), or any copper- or sulphur-containing proprietary mixture. If lime-sulphur is used, it should be diluted to 1 in 200.

TAYLOR (C. F.). **Peach branch cankers in Virginia and West Virginia.**—*Plant Dis. Reptr*, xxviii, 22, pp. 718–719, 1944. [Mimeographed.]

Rough cankers of peach branches, mostly initiated at a crotch, and characterized by prominent annular rings of callus are attributed to arsenical injury following the application of arsenical sprays without zinc sulphate, or the inefficient use of this substance as a means of rendering the arsenic safe. *Coniothyrium fuckelii* was predominantly associated with this canker.

ROBERTS (CATHERINE) & BARRETT (J. T.). **Intercellular mycelium of Taphrina deformans in Peach fruit.**—*Phytopathology*, xxxiv, 11, pp. 977–979, 1 fig., 1944.

Peach fruits from Davis, California, submitted to the writers for investigation by Dr. E. E. Wilson in 1942, bore discoloured, slightly raised lesions resembling those illustrated by R. E. Smith (*Ext. Circ. Calif. agric. Exp. Sta.* 120, 1941) and contained a small amount of subepidermal mycelium of *Taphrina deformans* essentially similar to that harboured by infected leaves. In a personal communication, Dr. Wilson reported the detection of asci and ascospores on the surfaces of some of the fruits in question, similar observations on peaches having previously been made by Clinton (*Rep. Conn. agric. Exp. Sta., 1914*, Part 1, pp. 1–42, 1914), G. and M. Arnaud in France [*R.A.M.*, xi, p. 526], and G. H. Cunningham on nectarine in New Zealand [ibid., ii, p. 373]. Herbarium specimens, mostly bearing raised lesions, from unknown localities in California, also yielded a profusion of intercellular, septate mycelium, sometimes at a depth of $2\frac{1}{2}$ mm. below the epidermis, besides subcuticular mycelium and ascogenous cells. Trichomes were scarce or absent on the surfaces of the elevated areas. On the other hand, the histological examination of fruits showing the warty protuberances figured by Rose *et al.* [ibid., xvi, p. 474], on which trichomes were plentiful, disclosed no trace of the fungus, and it is considered doubtful whether this symptom is indeed diagnostic of the presence of *T. deformans*. In this connexion attention is drawn to the similarity between the warts supposedly characteristic of leaf curl and the excrescences described by Blodgett as the distinctive feature of peach wart [ibid., xxii, p. 213].

COCHRAN (L. C.). **The 'complex concept' of the Peach mosaic and certain other stone fruit viruses.**—Abs. in *Phytopathology*, xxxiv, 10, p. 934, 1944.

The results of several years' study indicate that the intensity and type of symptoms induced by the peach mosaic virus from different sources on the Hale variety vary appreciably. Hitherto, viruses from different sources were arbitrarily divided, according to their effects on the host, into severe, medium, and mild categories and were designated as strains. However, the available information now indicates the existence of innumerable subdivisions which, given enough sources, overlap to form a symptom gradient in which no recognizable strains can be segregated. Thus, when the peach mosaic virus from various sources is inoculated into

apricot and certain other stone fruits, a severe to symptomless gradient develops which may or may not agree with the virulence of expression in peach. Similar gradients have also been observed in the cases of peach ring spot [*R.A.M.*, xxi, p. 85], asteroid spot [ibid., xix, p. 417], and some of the cherry viruses. In conformity with a suggestion by C. W. Bennett, it is proposed to reserve the term 'strain' for variants sufficiently well defined to be recovered from nature and identified, while viruses from individual sources causing a wide variety of symptom manifestations should be designated with appropriate descriptive epithets, as 'forms' or 'isolates', and collectively referred to as 'complexes'.

COCHRAN (L. C.) & RUE (J. L.). **Some host-tissue relationships of the Peach mosaic virus.**—Abs. in *Phytopathology*, xxxiv, 10, p. 934, 1944.

Evidence that the peach mosaic virus invades all living parts of the tree except the seeds was secured by inoculation experiments, in which infected leaf, fruit, bark, and wood tissues were inserted beneath the cortex in T cuts. Transmission was effected with green, hard-ripe, and firm-juicy-ripe fruit tissue, but not with soft-ripe or dried, or with fragments of integuments or embryo. Peaches further contracted infection when grafted in a similar manner with fruit tissue from diseased plums, apricots, and almonds, and wood shields cut from apricot and peach twigs stripped of their cambium. Peach trees inoculated at the close of the dormant period and when the leaves measured 1 in. developed mosaic symptoms in 14 and 50 days, respectively, while in those with fully expanded initial leaves infection usually became established only in shoots on a level with and below the site of insertion, and inoculations performed after June did not induce disease manifestations until the resumption of growth in the following year.

GRUBB (N. H.). **The comparative susceptibility of high- and low-worked Cherry trees in the nursery to bacterial canker.**—*Rep. E. Malling Res. Sta., 1943*, pp. 43–44, 1944.

Low-worked trees of Bigarreau Napoleon cherry in the nursery were significantly more injured by bacterial canker [*Pseudomonas mors-prunorum*: *R.A.M.*, xxiii, p. 31] when three years old from the bud than high-worked trees one year old from grafting. At two years old from grafting there was significantly less injury to the high-worked trees where the stocks were the vegetatively propagated F12/1 selection than where they were stocks raised from seed from any one of four sources.

MOORE (M. H.). **Cherry scab (Fusicladium cerasi (Rabenh.) Sacc.) in Kent in 1943.**—*Rep. E. Malling Res. Sta., 1943*, pp. 54–56, 1 fig., 1944.

On 21st July, 1943, Morello cherries at East Malling showed the presence of circular, olive-green spots measuring up to 2 mm. in diameter, scattered over the surface of the fruits. From these the conidia of *Fusicladium* [*Venturia*] *cerasi*, not hitherto recorded from the Station, were readily liberated in water, the mean size (100 spores) being 17·5 by 5μ, 54 per cent. 17 to 18μ long, 69 per cent. 5μ broad, range 9 to 22 by 4 to 6μ; twelve spores uniseptate, the remainder non-septate. Most were narrowly ellipsoid, rounded at the distal end, and slightly wedge-shaped at the other. Some tended to be slipper-shaped. No trace of the fungus was found on the bud scales and young shoots, and even on the young leaves infection was extremely difficult to find.

The disease was also present on a few fruits of the sweet variety Small Black Mazzard and the Duke variety Belle de Chatenay (nomenclature uncertain). Of the other acid varieties, Carnation, Coe's Late Carnation, and Kentish Red yielded many scabbed fruits. Apparently nearly all the sweet cherries escaped infection, possibly because they ripened earlier than the acid ones, which themselves appear

to have been unaffected at a slightly earlier stage. Infection was much heavier in the wetter than in the drier and windier end of the plot.

The fungus has been previously reported on cherry only four times in England in 25 years.

ZELLER (S. M.), MILBRATH (J. A.), & CORDY (C. B.). **Albino Cherry, a virus disease in southern Oregon.**—Abs. in *Phytopathology*, xxxiv, 10, p. 937, 1944.

Albino cherry, apparently a form of buckskin [*R.A.M.*, xxi, p. 83], first detected at Ashland in 1937, has now spread as far as Gold Hill, Oregon. Bing or Napoleon trees usually die three or four years after the initial symptoms appear, while Lambert, Black Republican, and Montmorency react more slowly, the effects occurring irrespective of the type of root used (Mazzard or Mahaleb). The disease is more severe in irrigated orchards than under dry-land culture. Die-back is a common symptom of infected branches, the leaves on which turn a uniform olive-brown to golden-greenish, with upward-rolling margins; just before abscission they assume a chlorotic to orange tinge, with a pinkish shading, especially in a pinnate pattern along the midrib and lateral veins at the base. Small, green, rosetted leaves are produced from terminal buds on the spurs during late summer. The fruits remain small and green, later turning white even in dark red varieties. Inoculation experiments do not form a satisfactory basis for the study of the symptoms of albino, since the trees die within a year of the operation.

DEMAREE (J. B.) & JEFFERS (W. F.). **Phytophthora fragariae Hickman and methods of testing Strawberry plants for resistance.**—Abs. in *Phytopathology*, xxxiv, 11, p. 991, 1944.

A new technique has been evolved for testing the resistance of strawberries to red stele (*Phytophthora fragariae*) [*R.A.M.*, xxii, pp. 363, 441, 488], consisting in the multiplication of the fungus on Lima bean agar in Petri dishes and the immersion in water of small pieces of the culture, which produce zoospores for inoculum. Suspensions of this material are added at the rate of 5 c.c. per pot to the soil in 2-in. pots in a cool greenhouse, in which the plants are kept pending the development of symptoms. Susceptible individuals contract the disease in two to three weeks; the remainder are reinoculated and, if still resistant, planted in naturally infested soil for fruiting tests.

ROGERS (W. S.) & BUTTFIELD (JOAN M.). **The production of healthy Strawberry runners (methods recommended for special stock nurseries).**—*Rep. E. Malling Res. Sta., 1943*, pp. 87–94, 4 figs., 1944.

In this paper the authors give a detailed account of the method recommended for the production of healthy strawberry runners, with special reference to the avoidance of virus diseases. The methods in question have been developed at East Malling and have been used for raising runners in the Ministry of Agriculture's Nuclear Stocks Scheme, which is being developed into a Special Stock Certification Scheme. The main points of the system are (1) treating runner-raising as a specialized business, entirely apart from fruit production, (2) establishing runner nurseries well away from existing strawberry areas, and (3) raising runners in these nurseries by an 'isolated block' system.

As regards disease control, to ensure that the bed starts free from infestation by *Capitophorus fragariae* all runners should be dipped before planting in a nicotine solution. Towards the end of May or early in June the bed should be dusted with flowers of sulphur as a precaution against mildew [*Sphaerotheca humuli*], the application being repeated, if necessary, in August. The virus diseases which are important at present are severe crinkle [*R.A.M.*, xxii, p. 32] and yellow edge [ibid., xxii, p. 240]. Crinkle symptoms usually reach their greatest intensity in June,

when the first roguing should be carried out, a second inspection being undertaken in September. Any yellow-edge plant seen at the first inspection should be removed, but the best time for roguing yellow-edge plants is from the middle of September to the middle of October. Under normal conditions, the percentage of plants removed, including those showing lack of vigour due to any other cause, has usually been under 1 per cent. With tolerant varieties, any plant showing reduced vigour, flattening, or visible symptoms of virus disease should be removed.

[This paper is reprinted in *Fruitgrower*, xcviii, 2542, pp. 156, 160; 2544, pp. 200, 206; 2546, pp. 238, 243, 1 fig., 1 diag., 1944.]

HARRIS (R. V.). **Norfolk Giant—a reliable Raspberry for the present day.**—*Rep. E. Malling Res. Sta., 1943*, pp. 108–110, 1 fig., 1944.

After pointing out that the Ministry of Agriculture is now prepared to undertake the inspection of stocks of Norfolk Giant raspberries 'in respect of purity and freedom from disease', the author expresses the opinion that this will introduce a completely new era in raspberry cultivation in Britain. Norfolk Giant possesses the valuable and distinctive feature of being highly expressive of both mosaic and leaf curl, although it has a marked natural resistance to mosaic. In spite of this, a small but growing proportion of mosaic-infected stocks is present in most plantations, which is appreciably higher where this variety has been raised alongside highly infected varieties such as Red Cross or Lloyd George [see above, p. 137]. This increase in mosaic disease must be promptly checked if the variety is to be preserved. This can easily be done, and all growers with young, healthy plantations of Norfolk Giant are urged to enter them for certification by the Ministry.

WORMALD (H.). **Nut drop—a disease of cultivated Hazel Nuts.**—*Rep. E. Malling Res. Sta., 1943*, pp. 56–58, 2 figs., 1944.

This is a reprint of a paper already noticed from another source [*R.A.M.*, xxiii, p. 136].

MCWHORTER (F. P.) & MILLER (P. W.). **The application of vapour heat as a practical means of disinfecting seeds.**—Abs. in *Phytopathology*, xxxiv, 10, pp. 935–936, 1944.

Moist heat supplied by a vapour-heat machine was shown by the results of several hundred tests to compare favourably in many respects with hot water for seed treatment, among its advantages being the following: (1) critical temperature control is unnecessary to ensure disinfection and prevent seed injury; (2) the treatment is readily applicable to tons of seed simultaneously; (3) the same machine removes the slight excess moisture without re-handling the seeds; and (4) vapour heat can be applied to seeds on moving belts suitable for large-scale commercial operations. Seed of peas, beet, cabbage, and various grasses can withstand temperatures of 140° to 150° F. for 90 to 40 minutes, respectively, without significant reduction or delay in germination. Species of *Macrosporium*, *Fusarium*, and *Sclerotinia* uniformly succumb to much lower temperatures in a shorter time. Practical control of *Phoma* [*betae*] has been demonstrated by this method, the value of which against *S.* [*sclerotiorum*] on cabbage was also shown by preliminary experiments.

WESTERN (J. H.). **Seed-borne fungi.**—*Nature, Lond.*, clv, 3924, pp. 36–37, 1945.

At a meeting of the British Mycological Society on 28th October, 1944, Dr. Mary Noble read a paper on blind seed disease (*Phialea temulenta*) of rye grass (*Lolium* spp.) [see above, p. 151], in which the identity of the fungus was discussed and reference made to the control of the disease by storing the seed until the organism has died out. Miss K. Sampson dealt with the endophytes of *Lolium* [*R.A.M.*, xxii, p. 138]. Dealing with broccoli canker (*Phoma lingam*) in the West Riding of

Yorkshire, where many farmers use their own seed, Dr. W. A. Millard stated that for some years he has accepted seed stocks from growers and cleansed them by immersion for 25 minutes in water at 50° C. Stocks are cleaned and propagated and handed back to the growers in a perfectly healthy condition. A case of seed-borne club root of swede (*Plasmodiophora brassicae*) was described by Dr. L. G. G. Warne, who was able to infect a clean sample of seed with washings from an infected one. Dr. A. Smith gave an account of seed examination as carried out at the Pathology Laboratory of the Ministry of Agriculture and Fisheries, Harpenden. Over 4,000 samples were examined in the year 1939–40. The main causes of rejection were *Ascochyta* [*pisi*] in peas, *Septoria* in celery [*S. apii-graveolentis* and *S. apii*] and parsley [*S. petroselini*], and halo blight (*Pseudomonas* [*medicaginis* var.] *phaseolicola*) in dwarf beans. The presence of *Ascochyta* in seed peas accounted for the rejection of 23 per cent. of all peas examined for export between 1925 and 1943. In the same period, 23 per cent. of all samples of celery seed and 31 per cent. of parsley were refused certificates because of the presence of *Septoria*. In recent years, the rejections for halo blight of beans have varied from 5 to 25 per cent. A sample of onion seed showed the presence of *Botrytis allii*. Dr. G. C. Ainsworth dealt with legislation in relation to seed-borne diseases and demonstrated the world distribution of certain seed-borne fungi with the help of maps [ibid., xxiv, p. 128].

HADDON (E.). **Notes on the importance of moulds.**—*Rev. agric. Maurice*, xxiii, 5, pp. 194–196, 1944.

The available information concerning the industrial production of citric acid and citrate of lime through the fermentation of sucrose by different moulds [*R.A.M.*, xiv, pp. 52, 604] is summarized.

WILKINS (W. H.) & HARRIS (G. C. M.). **Investigation into the production of bacteriostatic substances by fungi. VI. Examination of the larger Basidiomycetes.** —*Ann. appl. Biol.*, xxxi, 4, pp. 261–270, 1944 [1945].

Continuing their earlier studies [*R.A.M.*, xxiii, p. 308], the authors tested some 700 species of the larger Basidiomycetes for bacteriostatic properties. The results indicate that these fungi are among the most promising groups that produce antibiotics, comparing favourably in this respect with *Aspergillus* and *Penicillium*. Of the species tested, about 70 were strongly, and about 100 weakly positive against *Staphylococcus aureus* and/or *Bacterium coli*.

BATSON (D. M.), TEUNISSON (DOROTHEA J.), & PORGES (N.). **Study of a soil-burial method of determining rot resistance of fabrics.**—*Amer. Dyest. Reptr*, xxxiii, 21, pp. 423–427, 22, pp. 449–454, 3 graphs, 1944.

A review is given of the literature dealing with the mildewing and rotting of fabrics, and with methods of testing the resistance of such materials to microbial invasion. Various disadvantages were found to be inherent in the standard soil burial method of evaluation [*R.A.M.*, xxii, p. 359], and an attempt was therefore made, at the Southern Regional Research Laboratory, New Orleans, to devise a more suitable procedure. The tests were carried out in covered outdoor beds, using a soil mixture of equal volumes of coarse sand, clay loam, and well-rotted manure, a 9- to 10-in.-deep layer of which was maintained at a moisture content near 28 per cent. and a temperature of 85° to 90° F. Untreated and rot-proofed 6½-oz. cotton osnaburg and 8½-oz. jute burlap were tested, the treated fabrics containing 10 per cent. by weight of copper naphthenate (equivalent to 1 per cent. copper) [ibid., xxiii, p. 266]. Strips 9 by 1½ to 2 in. were buried vertically to a depth of 7 in., and five of each sample were removed at frequent intervals for breaking-strength measurements.

The period of burial required for complete decay of both the untreated materials

was six to eight days, whereas the impregnated strips of osnaburg and jute resisted disorganization for roughly 7 and 17 times longer, respectively. In preliminary tests on cotton osnaburg in an indoor bed, horizontally buried strips lost breaking strength at about the same rate at varying depths below 1 in. but more slowly at ¼ in. At or below 1 in. the strips were completely rotted in six days at a soil temperature of 86±2° and in eight at 75±4°. Strips buried vertically in trenches rotted uniformly at varying depths, while those pushed down with a metal blade decayed most rapidly in the lower portions.

On the basis of these results it is recommended that (*a*) an 85 per cent. loss in breaking strength be considered as the practical end point of fabric-rotting, and (*b*) the rot resistance of a fabric be expressed as the ratio between the number of days' burial required to cause such a loss in any given fabric and the number of days necessary for a comparable effect to develop in copper naphthalene-treated specimens of the same fabric containing 1 per cent. copper.

TWEEDIE (AUDREY S.) & BAYLEY (C. H.). **The preservation of cordage.**—*Canad. Text. J.*, lxi, 13, pp. 31–32, 34, 38, 1 fig., 1944.

Copper naphthenate [see preceding abstract], applied to manila, sisal, cotton, 'wartime', and hemp ropes, ⅜ in. in diameter, gave highly satisfactory control of microbiological deterioration, as gauged by the soil-burial test, preceded by 24 hours' leaching in running water at 20° C. In the treated samples the maximum loss in breaking strength was 12 per cent. (in manila), compared with 65 to 94 per cent. for the untreated exposed to comparable conditions. The relevant specification in the Schedule of Methods of Testing Textiles of the Canadian Government Purchasing Standards Committee [*R.A.M.*, xxiii, p. 184] requires the presence in the treated rope of a minimum of 0·5 per cent. copper. In these experiments the amounts actually found at the end of the soil-burial period were 0·38, 0·41, 0·47, 0·53, and 0·66 per cent. for sisal, manila, 'wartime', cotton, and hemp, respectively, but since adequate protection was conferred even on the harder fibres, with their lower absorptive properties, a copper content of roughly 0·2 per cent. may be regarded as sufficient. However, in order to conform to the official regulations and leave a margin of safety against loss through weathering, the copper content of the preservative should be adjusted to the capacity for intake of a given fibre.

HIRSCHMANN (DORIS J.), ZAMETKIN (MARIAN), & ROGERS (RUTH E.). **The utilization of wool by four saprophytic micro-organisms in the presence of additional nutrients.**—*Amer. Dyest. Reptr*, xxxiii, 17, pp. 353–359, 2 figs., 1944.

The growth of *Bacillus mesentericus*, *B. subtilis*, *Actinomyces albus*, and *Chaetomium globosum* was studied in the presence and absence of de-greased, sterilized wool fabric on Czapek's liquid medium and the same with the omission of sucrose or sodium nitrate or both. The same media were used in the solid form by the addition of agar. The effect of incorporating an aqueous wool extract with the different liquid media was also investigated.

The best growth was made on the complete Czapek's solution or agar, development on the modified synthetic substrata being less abundant and on the water agar absent or scanty to fair, while *C. globosum* was the only one of the organisms capable of existing on distilled water. All grew, however, in the last-named with the addition of wool fabric or extract, which also exerted a stimulatory action on the development of saprophytes in the other media. Wool in distilled water without added nutrients was attacked only by *C. globosum*, and that to a limited extent. *C. albus* was the most active of the saprophytes in the disintegration of wool fibre on all the substrata except distilled water.

Wool fibre would appear from these experimental data to be relatively resistant

to the organisms under observation, which readily utilized, however, the soluble products arising from the hydrolysis of the material.

FULTON (C. O.), GIBBONS (N. E.), & MOORE (R. L.). **The fungicidal effect of vegetable-tanned leather and various disinfectants on Trichophyton gypseum and T. interdigitale.**—*Canad. J. Res.*, Sect. F, xxii, 6, pp. 163–168, 1 pl., 1944.

An investigation into methods of disinfecting old shoes that are to be re-conditioned and re-worn showed that new, vegetable-tanned, fat-liquored leather had a fungicidal effect on one strain of *Trichophyton gypseum* and two of *T. interdigitale* tested, but not on several strains of common mould contaminants, including *Aspergillus fumigatus*, *A. flavus*, *Rhizopus nigricans* [*R. stolonifer*], and an unidentified species of *Alternaria*. Chrome-tanned leather, vegetable-tanned leather from an old shoe, and vegetable-tanned leather leached overnight in running water did not show fungistatic or fungicidal properties.

Of various disinfectants tested under conditions resembling those of the fat-liquoring operation, the most effective was phenylmercuric acetate, which destroyed *T. gypseum* in 18 hours at a concentration of 1 in 100,000, a dilution of 1 in 1,000 being required to produce the same effect in the same time when commercial formalin or dihexylin was used. Leather treated with phenylmercuric acetate at 1 in 100,000 would be unlikely to cause skin injury.

PLATON (B.) & THOMÉ (K. E.). **Försök rörande bekämpning av ostmögel genom bestralning med sterilamps.** [Experiments in the control of cheese moulds by irradiation with 'sterilamps'.]—*Medd. Meijeriförs., Alnarp*, 10, 1942. [Swedish, with English summary. Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 309–310, 1944.]

Details are given of laboratory and storeroom experiments in the control of cheese moulds (*Penicillium glaucum*, *Aspergillus niger*, *A. glaucus*, *A. candidus*, *Mucor hiemalis*, *Oospora lactis*, *Stemphylium* sp., and *Torulopsis* sp.) by irradiation with ultra-violet 'sterilamps' 80 cm. in length from a distance of 50 to 150 cm. After four weeks' exposure in the refining room, all the irradiated cheeses were practically mould-free, whereas two-thirds of the untreated were infected, the corresponding figures after five weeks being 95 and 90 per cent., respectively; at the end of six weeks one-third of the irradiated cheeses were still sound, while the untreated were all mouldy, and even after two months only nine out of 300 in the treated lot were found to harbour mycelia. Since the moulds continue to grow under a layer of paraffin even on irradiated cheese, it is very important to remove all trace of them before applying the wax.

Summary of the papers presented at the plant quarantine session.—*Phytopathology*, xxxiv, 11, pp. 994–996, 1944.

The first annual meeting of the Potomac Division of the American Phytopathological Society, which took place at the Bureau of Plant Industry Station, Beltsville, Maryland, on 23rd and 24th February, 1944, included a session on plant quarantine problems. W. A. MCCUBBIN gave an introductory review of the situation in the United States, with special reference to national planning for the organization of foreign plant disease exclusion measures [*R.A.M.*, xxiv, p. 89]; H. P. BARSS discussed the application of quarantine regulations to the protection of basic national crops; N. R. HUNT emphasized the urgency of the study of foreign diseases, having regard to the likelihood of their spread under war-time conditions; L. M. HUTCHINS drew attention to the difficulties involved in the prevention of foreign virus disease introduction; and R. K. BEATTIE urged the advisability of detention procedures to guard against the deferred development of dormant infections.

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SNOW (D.) & WATTS (P. S.). **Storage of oilcakes. Experiments with sulphonamide E.O.S. and propamidine as preservatives.**—Reprinted from *Food* (*Hannah Dairy Res. Inst. Reprint* 161), 3 pp., 1 fig., 2 graphs, 1945.

After pointing out that when feeding-stuffs have to be stored under unsatisfactory conditions, the relative humidity cannot always be maintained below the safe level of about 70 per cent., and that in such cases the use of a non-toxic preservative might increase the storage life, the authors describe experiments in which sulphonamide E.O.S. and propamidine were applied to linseed cake by (*a*) incorporating fixed amounts in ground samples, and (*b*) spraying 1 in. cubes of the cake with solutions in 80 per cent. ethyl alcohol. The samples were then stored in desiccators at 25° C.

The results showed that at humidities above 80 per cent. R.H. the drugs markedly inhibited moulds (*Penicillium* spp. and members of the *Aspergillus glaucus* group). With both methods of application the effect was most striking with sulphonamide E.O.S., which incorporated at a concentration of 0·2 per cent. more than doubled the storage life of samples stored at 85 and 80 per cent. R.H. The storage life of cubes sprayed with a 2 per cent. solution of sulphonamide E.O.S. was two to three that of the control cubes sprayed with alcohol alone, and three to four times that of the untreated cubes. With both methods of application propamidine was less effective than sulphonamide E.O.S. This was unexpected, as the former showed a greater fungistatic power than the latter in other workers' investigations.

Although both drugs are toxic, no ill effect need be expected from feeding oilcakes containing 0·2 per cent. sulphonamide E.O.S., since the normal therapeutic dose given orally for mastitis in dairy cows is 4 oz. a day for 14 days. If 5 lb. of cake containing 0·2 per cent. of the drug were consumed daily, the daily intake would be only $\frac{1}{25}$ of the normal therapeutic dose. By spraying a solution of the drug on to the surface of the cake (which is believed to be the better method), the amount ingested would be very much less.

These results warrant an investigation of the application of the drugs that should be carried out on a larger scale under commercial conditions.

SALLANS (H. R.), SINCLAIR (G. D.), & LARMOUR (R. K.). **The spontaneous heating of Flax seed and Sunflower seed stored under adiabatic conditions.**—*Canad. J. Res.*, Sect. F, xxii, 6, pp. 181–190, 4 graphs, 1944.

The spontaneous heating developed by various grains under certain moisture and storage conditions, known commercially as 'bin burning', is responsible for serious damage and, at an advanced stage, renders the products worthless. Flax and sunflower seed in an adiabatic thermostat with an initial temperature of 19·5 to 21°, rising to a maximum of 51 to 52° C., became heated in less than two months at moisture contents of 11·4 and 10·5 per cent., respectively, from which it would appear that the commercial limits of 10·5 and 9·5 per cent. set for these two grains are not too low. The acceleration in the over-all respiration rate of the two kinds of seed preceding heating indicates the active participation in the process of

proliferating micro-organisms, among which species of *Aspergillus* and *Penicillium* are believed to be represented, though no attempts at isolation or identification were made.

On the basis of these data, it is suggested that a relative humidity in excess of 74 per cent. of the interstitial air in bulk grain will promote microbial growth and resultant heating. Hence it follows that the moisture content of any grain, in equilibrium with air at a relative humidity of 74 per cent., will closely approximate the upper limit admissible for inclusion in 'straight' grades.

SMITH (K. M.) & MARKHAM (R.). **Importance of Potato virus X in the growing of Potatoes.**—*Nature, Lond.*, clv, 3924, pp. 38–39, 1945.

Of the three potato virus diseases important to the grower, leaf roll, severe mosaic (virus Y), and mild mosaic (virus X), the first two are not common in the best seed-growing parts of Scotland and being easily visible can be eliminated by roguing. The third, on the other hand, is present in a very high proportion of the best Scotch seed potatoes, not excluding those with a Stock Seed certificate, and probably including all the Scottish stocks of Kerr's Pink; except in a few varieties, such as King Edward and Epicure, it cannot be detected by inspection alone. To determine whether a potato plant is virus-free, inoculations must be made to indicator plants and grafting carried out to susceptible varieties. Very few Scotch seed potatoes will pass these tests.

There are in existence, however, at the Plant Virus Research Station, Cambridge, small stocks of potatoes completely free from virus disease, including Kerr's Pink, and up-to-date multiplication is being carried out in co-operation with the National Institute of Agricultural Botany. The nucleus virus-free stocks are grown in Northern Ireland [cf. *R.A.M.*, xxiii, p. 497]. As soon as sufficient tubers are raised, they are planted on the island of Islay, off the west coast of Scotland, where no other potatoes are grown. In about two years' time, several thousand tons of virus-free seed potatoes should be available. Samples are sent to Cambridge from Ireland periodically for testing, and in 1944, 1,500 tubers grown out of doors for three years were examined. The great majority were still virus-free, though a few tubers of one line of Majestic showed mild mosaic. There was reason to believe, however, that some of these tubers might have been infected before being despatched to Ireland. This and other evidence indicated that virus X spreads very slowly in the field.

J. R. Scott's investigations showed that negligible mottle reduced yields by 13 per cent., as compared with 'healthy' plants [ibid., xx, p. 487], but as his 'healthy' plants were probably X-infected, his results actually correlate yield reduction with symptom severity. There would appear to be little doubt that the presence of virus X materially reduces yield, a view supported by Bald's recent work [ibid., xxiii, p. 145; see also xxiv, p. 113].

A somewhat extensive yield trial was carried out at Cambridge with the potatoes from Ireland, all of which had been found virus-free. They were planted in 60 plots, each of four rows of ten half-tubers. Half the plants were inoculated with a very mild strain of virus X from stock seed Arran Peak. Some weeks later, 25 inoculated plants were selected at random and all were found to show the presence of virus X, though it was not possible during the summer to distinguish the inoculated plants from the others by inspection. When the tubers were harvested and weighed, the yield from the inoculated plants was 12 per cent. less than that of the virus-free plants, a highly significant difference. All varieties showed reduced yield as a result of the presence of X. These results seem to prove that infection by virus X, even by those strains which are normally passed over by the inspectors, results in considerable crop loss.

The elimination of virus X from Scotch seed potatoes would appear by no means

impossible. The solution seems to lie in a gradual replacement of the infected stock seed, and in this process it is hoped that the stocks built up by the Plant Virus Research Station in co-operation with the National Institute of Agricultural Botany may play a part.

ALLAN (J. A.). **Fluorescence in ultra-violet light as a test for the presence of leaf roll virus in Potato tubers.**—*Nature, Lond.*, clv, 3926, p. 116, 1945.

Cut surfaces of tubers from leaf-roll potato plants examined under ultra-violet light from a 230 v. 125 amp. 3-pin base bulb with a Wood's glass filter displayed varying amounts of fluorescence, which was most marked in the setts, where it appeared to extend throughout the medulla; it was more limited in distribution in tubers of the present season's growth, where it appeared to be confined to the vascular bundles. Cut tubers from healthy plants showed a much lighter colour on the cut surfaces than on the skin, but no fluorescence.

WILSON (A. R.) & BOYD (A. E. W.). **Potato wastage in clamps.**—*J. Minist. Agric.*, li, 11, pp. 507–512, 1 diag., 1945.

A very large tonnage of potatoes is lost every year in Britain in clamp storage, particularly after a wet autumn, such as that of 1944. Rain penetration, frost injury, or the inclusion of too many tubers affected by blight [*Phytophthora infestans*] may induce whole or partial collapse of the clamp. Tubers injured by frost, waterlogging, or blight quickly become attacked by bacterial rots. The temperature in the clamp rises, and the carbon dioxide content of the atmosphere increases. These conditions may induce soft rots, with further increases in temperature, which sometimes reaches over 112° F. This heat greatly accelerates sprouting and loss of weight through evaporation, and may cause internal blackening of the tubers. If the start of such overheating could be observed by means of a clamp thermometer, it should be possible greatly to reduce losses by providing immediate ventilation. In the present year, when many clamps have, necessarily, been built with tubers not in the best condition, the use of clamp thermometers might save much unnecessary waste. These instruments appear to have been used in Germany for some years.

Blighted tubers become included in clamps in three ways. Quite obviously diseased tubers may be carelessly thrown in with sound ones, some, not apparently affected, may be unavoidably included, and, thirdly, the crop may be lifted with infection still active on the green haulms. Haulms should be burnt off at least ten days before lifting.

Whether the inclusion of blighted tubers in clamps conduces to collapse or not depends on many factors. The disease does not appear to spread from affected to sound tubers in the clamp. Small pockets of rotten tubers seem to result from localized areas of overheating, initiated by the decay of a few blighted tubers, followed by soft rots. If 25 per cent. (often fewer) of the tubers in a clamp are blighted, there is great danger of overheating and total collapse, though much depends on the amount of moisture present. In dry clamps, blighted tubers may remain free from soft rots and merely shrivel up.

Mechanical damage, one of the commonest sources of wastage, is often unnecessarily increased by faulty setting of the spinner and careless manipulation while clamping and dressing. Dry rot fungi (*Fusarium* spp.) readily gain entrance to susceptible varieties through wounds caused in this way.

Other causes of loss in clamps include mineral deficiencies in the soil, which induce serious forms of blackening, pink rot [*Phytophthora erythroseptica* and *P. megasperma*], watery wound rot [*Pythium ultimum*], and blackleg [*Erwinia phytophthora*], which may lead to considerable losses in individual instances, and common

scab [*Actinomyces scabies*]. This last may prevent the stocks from reaching standard, but secondary rots do not generally follow it, so that loss is never complete.

The chief precautions to take are (1) to exclude blighted tubers, (2) provide protection against frost and rain by using fresh, dry straw, if necessary, at earthing-up, (3) build the clamps so that they provide protection against inclement weather, and (4) watch for overheating in spring, and de-soil strips to permit cooling when this occurs.

ROEHL (L. M.) & KNORR (L. C.). **A rotary cutting knife to control the spread of Potato ring rot.**—*Ext. Bull. Cornell agric. Exp. Sta.* 660, 8 pp., 2 figs., 7 diags., 1944.

The best control of potato ring rot [*Corynebacterium sepedonicum*] is achieved by using each year new, disease-free seed after disinfecting the equipment and buildings, but this may not always be possible. The disease is chiefly spread by means of the knife used in cutting the tubers for seed purposes, and it has been established that the knife may be easily disinfected by dipping it into boiling water [*R.A.M.*, xxiv, p. 31]. The authors give detailed instructions for making an inexpensive motor-driven machine for cutting tubers for planting, by means of a rotary knife, capable of disinfection by passing the blade through a tank of water kept boiling electrically or otherwise. The machine can be set up with the tools and materials usually available on a farm at a cost of about $20. Tests of the machine in 1943 and 1944 showed that as many as 49 bush. per acre were gained by its use in one experiment, a highly significant result.

LARSON (R. H.). **The ring rot bacterium in relation to Tomato and Eggplant.**—*J. agric. Res.*, lxix, 8, pp. 309–325, 3 pl., 8 figs., 1944.

Investigations on the relation of the potato ring rot organism (*Corynebacterium sepedonicum*) to the host tissues of tomato, on the development of the disease in tomato and eggplant, and on the host range of the organism are described. Inoculations made by dipping a needle point into a pure culture of *C. sepedonicum* from potato and inserting it directly into the vascular region of tomato plants, or by puncturing with a needle through a water suspension of the organism into the vascular tissue of the lower stem, demonstrated that *C. sepedonicum* may readily cause severe wilting and death of tomato plants. The organism was found to invade the plants systemically through the xylem, seldom affecting the adjacent phloem and parenchyma in the initial stages. The intercellular spaces of younger xylem tissues showed only slight enzymatic action in advance of the bacteria, and lignification and the formation of sclereids was not observed.

In infected mature fruit, the organism was traced from the invaded place of fruit attachment through the tracheae in the placental region and locular cavity directly to the funiculus of the seed. In the seed, the bacteria were found between the integument and endosperm in the micropylar region between the embryo and the endosperm. Seed transmission was demonstrated. All the tomato varieties tested were suspectible. Infection occurred in all tomato transplants when planted in soil recently infected with suspensions of bacteria. No infection occurred when tomatoes were planted in inoculated soil held throughout winter in the field. In all the commercial varieties of tomato inoculated systemic invasion occurred, and infection resulted in a typical necrotic or moribund stage.

All varieties of the common garden eggplant were ascertained to be susceptible, as was *Solanum integrifolium*, while Puerto Rican Beauty and selection E-12 were resistant.

While the disease has so far been reported in the field only on potato, the present work confirms the view that *C. sepedonicum* is not specific to this host.

SCHARFF (J. W.) & CATANEI (A.). **Champignons inférieurs isolés de l'humus obtenu à Alger par la 'méthode d'Indore'.** [Lower fungi isolated from the humus obtained at Algiers by the 'Indore method'.]—*Arch. Inst. Pasteur Algér.*, xxii, 3, pp. 162–165, 1944.

The following micro-organisms were isolated from May to August, 1943, from a compost heap in the garden of the Pasteur Institute, Algiers, prepared by Sir Albert Howard's 'Indore method': *Actinomyces aureus*, *A. griseus*, *A. exfoliatus*, *A. albus*, *A. olivochromogenus*, *Rhizopus arrhizus*, *R. reflexus*, *Mucor mucedo*, *Aspergillus fumigatus*, *A. flavus*, *A. nidulans*, *A. niger*, *A. candidus*, *Penicillium glabrum*, *P. chrysogenum*, *P. glaucum*, *P. rugulosum*, and *Hormodendrum* sp.

KEYWORTH (W. G.). **Diseases of Hops.**—*Rep. E. Malling Res. Sta., 1943*, pp. 28–29, 1944.

Since *Verticillium* wilt of hops [*V. albo-atrum* and *V. dahliae*: *R.A.M.*, xxiii, p. 2] was first discovered in 1924 [ibid., v, p. 278], 150 outbreaks have been recorded at East Malling, of which 67 were noted in 1943. That this latter number is so large is due partly to the fact that many long-standing outbreaks of a mild type were reported during a Ministry of Agriculture inspection of hop gardens from which cuttings were to be taken. The disease continues to spread from old-established centres. Soil disinfection as carried out in commercial practice appears to be of doubtful value in the control of large outbreaks, but more intensive methods are still recommended for small ones. Two commercial experiments demonstrated that the application of large quantities of dung or sulphate of ammonia had no effect on incidence in badly affected areas. In a preliminary test on artificial soil infection in two districts, disease intensity, as estimated by the number of affected plants and the severity of the symptoms, was much greater in one than in the other. This appeared to be due to differences in the soil conditions.

Resistance tests of the Wye seedling varieties were continued, and seven varieties were selected as showing high resistance in their first two years' tests; brewing tests demonstrated that at least three of these are commercially acceptable.

MCMARTIN (A.). **Three-years old Cane and the health of the crop.**—*S. Afr. Sug. J.*, xviii, 10, p. 421, 1944.

Field observations at Eshowe, Natal, having suggested an increased incidence of red rot [*Physalospora tucumanensis*: *R.A.M.*, xxiii, p. 149; xxiv, p. 120] in plantations where the previous crop had been cut as cane over two years old, resulting in a heavy drop in the tonnage (from 37·1 to 4·9 tons per acre in one case), a trial was carried out at the Experiment Station, Mount Edgecombe, to verify this supposition. Two small plots of Co. 290, very slightly infected by red rot at two years old (in 1943) were left standing till 1944 to ascertain whether the first ratoon crop would show any substantial increase in the disease over other plots cut at two years old as plant cane. At the same time, two plots of Co. 331 adjacent to the Co. 290 were similarly treated. On cutting, the sticks were divided into three groups, namely, (*a*) dead, these being too dry for the diagnosis of any particular disease, but as they showed two seasons' growth and had evidently flowered in 1943, they must have been third-year canes; (*b*) canes showing two seasons' growth, most of which were healthy; and (*c*) those in their first year, all sound. The two plots of Co. 290 contained in all 329 canes of group (*a*), 421 of (*b*), and 274 of (*c*), the corresponding figures for Co. 331 being 408, 469, and 378, respectively. The sucrose contents and purity of groups (*b*) of Co. 331 were 13·13 and 90·6 per cent., respectively, and those of (*c*) 13·52 and 91·3, respectively, the corresponding figures for Co. 290 being for (*b*) 14·48 and 90·6 and for (*c*) 15·25 and 87·1 per cent., respectively. A neighbouring two-year-old plot of Co. 331 was found to have a sucrose content of 13·78 and purity of 91·2 per cent.

It is apparent from these data that the elimination of unsound sticks from crops of three-year-old cane would ensure a supply of reasonably high-quality material for milling, but the question arises of the wisdom of leaving large numbers of diseased sticks in the field for a sufficiently lengthy period to add considerably to the reservoir of inoculum available for the infection of the new crop. As an alternative to the practice of cutting the cane at two years, which is decidedly preferable from the hygienic standpoint but may be impracticable without a readjustment of the present system, dead and diseased canes should be collected in heaps and burnt.

D[ODDS] (H. H.). **Experiment Station notes.**—*S. Afr. Sug. J.*, xxviii, 9, 367–369, 371; 11, pp. 467, 469, 471, 1944.

Included in these notes [cf. *R.A.M.*, xxiii, p. 148] are reports from the Botanist [A. McMartin], incorporating the following information. Specimens of diseased sugar-cane leaves received from Sena Sugar Estates, Portuguese East Africa, were ascertained to be infected by smut [*Ustilago scitaminea*].

Mosaic was detected on the promising N.Co. 339 variety, and streak on N.Co. 326, the former also being attacked by *Cytospora sacchari*, which is new to South Africa.

Aretan (0·5 per cent.) has proved almost equally effective with ceresan in the control of pineapple disease [*Ceratostomella paradoxa*: ibid., xxii, p. 453], and is simpler and more economical in use than the latter. These two preparations are the only organo-mercurials at present available in the country.

RENDLE (B. J.). **Nomenclature problems of the applied biologist.**—*Nature, Lond.*, cliv, 3922, pp. 812–814, 1944.

This is a summary of the discussion on practical problems of botanical and zoological nomenclature held at a meeting of the Association of Applied Biologists on 10th November, 1944. Those taking part included J. Ramsbottom, G. R. Bisby, B. J. Rendle, A. Roebuck, I. Thomas, and F. Hemming.

JENKINS (ANNA E.). **Two new records of Sphaceloma diseases in the United States.**—*Phytopathology*, xxxiv, 11, pp. 981–983, 1 fig., 1944.

In July, 1943, specimens of *Aralia spinosa* leaves infected by scab (*Sphaceloma araliae*), hitherto known only from Maryland [*R.A.M.*, xvii, p. 203], were received through C. M. Tucker from a north-eastern Missouri nursery.

S. murrayae [ibid., xxiii, p. 48] was collected in the following month on *Salix lasiandra* foliage in Washington, this being the first record of the fungus for the State and for this host species. Commenting on the geographical distribution of willow scab, C. R. Ball points out that the causal organism is now known to occur on five species of *Salix* belonging to four sections of the genus. It has been collected in four continents, represented by New Zealand, Latvia, Argentina, and the United States. Nearly all the localities reported to date as habitats of *Sphaceloma murrayae* are either on the coast or within reach of maritime influences. These facts, considered in conjunction, are thought to indicate a wider host and geographical range than has yet been established for the pathogen.

SOLHEIM (W. G.). **Mycoflora saximontanensis exsiccata. Centum IV.** [Exsiccata of the Rocky Mountain mycoflora. Fourth hundred.]—*Univ. Wyo. Publ.* (formerly *Univ. Wyo. Publ. Sci.*), x, 4, pp. 33–46, 1943.

Three new species and a number of parasitic fungi are included in this list of fungi collected in the Rocky Mountains between 1929 and 1932.

COOKE (W. B.). **Notes on the ecology of the fungi of Mount Shasta.**—*Amer. Midl. Nat.*, xxxi, 1, pp. 237–249, 1944.

In this paper the author discusses the ecology of the fungi found on Mount

Shasta [northern California] under the main headings of biological factors (morphological and physiological aspects and methods of spore disposal), ecological factors (lack of correlation with life zones, snow-line fungi, and host restriction), the ecological classification of the fungi, and their geographic relationships. In his view, the distribution of fungi is primarily controlled by their adaptability to hosts and substrata, regardless of the relationship of the hosts to each other and their altitudinal distribution. The paper concludes with a table recording 154 genera of fungi, including 274 species, and 358 records of saprogenic and pathogenic activity on more than half of the nearly 500 known species of vascular plants on Mount Shasta. The elevations at which the hosts occur are given and their annual or perennial habit indicated.

RYJKOFF (V. L.), VOVK (A. M.), & ALEXEEVA (MME T. S.). **On the physiological peculiarities of the yellow strain of Tobacco mosaic virus.**—*C. R. Acad. Sci. U.R.S.S.*, N. S., xlii, 2, pp. 84–86, 1 fig., 1944.

The detection of some sharply defined light yellow spots in tomato plants infected with tobacco mosaic led to the isolation of a virus considered to be a yellow strain of the tobacco mosaic virus [*R.A.M.*, xxiii, p. 460], very similar to the white strains. In tomato plants, inoculation with juice from such spots resulted in an abnormally severe form of mosaic, characterized by yellow or nearly white spots on the youngest leaflets with subsequent lack of chlorophyll in the leaves, depression in growth of the whole plant, and dying-off of parts of leaves or entire leaves. In tobacco plants, inoculation resulted in a yellow mosaic of a somewhat unusual pattern followed by necrosis and dying-off of the leaves. The cells of plants infected with the yellow strain contain typical hexagonal Iwanovsky crystals. Tobacco plants infected with the green strain of the virus defied infection with the yellow strain and vice versa; while in the case of tomato plants neither strain was entirely suppressed by the other. The yellow strain was inactivated by a temperature of 86° C. and the green strain by one of about 90°. The yellow strain was inactivated by a hydrogen peroxide concentration of 0·15 per cent. while the green strain was not completely inhibited by any within the range of between 0·01 and 0·15 per cent. When halves of the same tobacco or tomato leaf were inoculated with juice containing either the yellow or the green strain, it appeared that the green strain always accumulated at a higher rate than the yellow one, and particularly so in tomato.

SOUKHOV (K. S.). **Salivary secret of the aphis Myzus persicae Sulz. and its ability to form a filtering apparatus.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xlii, 5, pp. 226–228, 1 fig., 1944.

After describing the process of penetration into plant tissue by the aphis *Myzus persicae* and the manner in which it receives the vegetable sap in a filtered state without any suspension of solid particles, the author states that the stylet of the vector, when inserted into cells containing virus inclusions, does not induce solution of the crystals, even in the case of contact. This circumstance is taken to explain the inability of the aphis to transmit the virus of tobacco mosaic.

WALKER (E. A.) & MCINROY (SARAH W.). **Tobacco anthracnose, a new Tobacco plant bed and field disease.**—Abs. in *Phytopathology*, xxxiv, 11, p. 993, 1944.

Tobacco anthracnose assumed the form of a leaf spot in commercial seed-beds in May, 1941, near Waldorf, Maryland, and in the following year it was very destructive on crops in poorly drained soils. In the seed-bed infection occurred in the shape of foliar spots, seedling blight, and cankers on the midrib, petiole, and stem, the last-named symptom extending in the field to the branches of the flower head and the seed pods. The disease was found to be readily transmissible by means of contaminated seed. The pathogenicity of a species of *Colletotrichum* consistently

isolated from leaf spots and stem cankers was established. Sectors of the fungus in culture gave rise to a *Gloeosporium*, which was also obtained from diseased tobacco plants. Some strains of both organisms produced spiral growth on certain media.

YOUNKIN (S. G.) & DIMOCK (A. W.). **Foliage infections of Lycopersicon esculentum by Colletotrichum phomoides.**—*Phytopathology*, xxxiv, 11, pp. 976–977, 1 fig., 1944.

Rutgers, Marglobe, Early Baltimore, John Baer, Chicago, and Garden State tomato seedlings, inoculated with suspensions of spores, sclerotia-like bodies, and mycelium of *Colletotrichum phomoides* [*R.A.M.*, xxii, pp. 157, 502, and next abstract], which is generally believed to be confined to the fruits, developed in five to seven days a necrotic spotting of the leaflets and cotyledons, the latter being involved to the extent of a quarter to a third before abscission. The lesions on the under sides of the leaflets were sunken, owing to the collapse of the mesophyll, and surrounded by a chlorotic halo; they attained a maximum diameter of 2 mm. Each lesion harboured spores of *C. phomoides*, generally only two or three, though in some cases they were present in larger numbers. In one trial at the Riverton (New Jersey) laboratory, all the 240 plants inoculated contracted the disease, the number of leaf spots ranging from four to 198 per plant. The fungus was recovered from the infected tissues of 28 out of 30 leaflets planted out on potato dextrose agar and reinoculated into tomato seedlings with positive results. In another trial, 12 out of 14 cotyledonary lesions, 18 out of 20 from leaflets with necrotic spots, and 18 out of 20 from leaflets with diseased tips yielded the pathogen on the same medium.

MCNEW (G. L.). **Control of anthracnose on cannery Tomatoes.**—*Canner*, xcviii, 25, pp. 21–22, 46, 48, 50, 3 figs., 1944.

Anthracnose or ripe rot (*Colletotrichum phomoides*) [see preceding abstract], admittedly the most important disease of tomato fruits, appears to be increasing in intensity, being most destructive in the Tri-State area of the Atlantic seaboard and also causing substantial reductions in Indiana, Ohio, and western New York. A remarkable feature of the pathogen is the extensive loss resulting from even a moderate incidence of infection, which is usually under 30 per cent. The cost of picking is doubled or even trebled by the presence of only 5 or 10 per cent. infection, since each fruit must be carefully examined on all sides, while the cost of processing is raised by the additional sorting and trimming required. Even more serious is the waste of pulp on account of high mould content when healthy fruits are contaminated through contact with diseased ones. Half-a-dozen severely infected fruits in a bushel basket may unfit the entire lot for human consumption according to the stringent Government regulations now in force. Anthracnose may completely upset factory operations before its presence is detected, as in 1941, when the admixture with sound fruits of diseased fruits from an area of six acres (less than ½ per cent. of the total) imperilled the crop from the entire locality until the source of the trouble was located and the suspected material set aside for special sorting.

The life-history of *C. phomoides* is somewhat obscure, and even the environmental conditions needed for its development have not received sufficient attention. Circumstantial evidence definitely points to the overwintering of *C. phomoides* on diseased plant refuse in the field, and further suggests its transmission through the seed. Crop rotation and hot-water treatment of the seed should therefore be practised as precautionary measures. Anthracnose makes a sudden appearance and disappears with equal rapidity. It is sometimes limited to a single picking or to one section of a field, and frequently occurs with particular virulence on plants enfeebled by defoliation diseases.

C. phomoides is not amenable to control by improved cultural practices alone, and experiments have therefore been carried out to determine the relative efficacy

for this purpose of various new fungicides in comparison with Bordeaux mixture 4-2-50. In September, 1942, the disease developed in two fields of the John Baer variety in Wayne County, New York, where tests were already in progress against leaf blight [*Septoria lycopersici*]. The incidence of anthracnose (average of four trials) in the plots sprayed five times with Bordeaux, fermate (2–100), copper oxychloride sulphate (4–100), and left untreated was 9·8, 2·9, 12·9, and 16·6 per cent., respectively, and the corresponding yields of marketable fruit per acre 30,284, 29,021, 31,116, and 23,701 lb., respectively. In a further experiment in Ontario County, New York, in which four applications were given of sulphur (5–100), tribasic (4–100), fermate (2–100), and Bordeaux (4–2–50), the average (three tests) incidence of anthracnose was 16, 25·1, 1·4, and 13·7 per cent., compared with 32 in the untreated plot. The disease developed exclusively on fruit ripening between 13th and 25th September.

The percentage of fruits attacked is not the only way of measuring the severity of anthracnose infection. To the processor, the primary consideration is the amount of fungal growth in the fruit, and from this standpoint fermate did much more than reduce the incidence from 32 to 1·4 per cent., the former representing thousands of spots (20 to 80 on each fruit on many plants), and the latter three or four, mostly less. As regards the mould content of the fruit, fermate probably lowered the proportion from between 300 and 600 units to one—an immensely important factor in relation to the high standards imposed by the existing regulations referred to above.

Before fermate can be generally recommended, however, for anthracnose control, further tests must be made in different localities and during other seasons. Moreover, since it fails to control foliar diseases, a spray schedule combining fermate with the copper compounds will have to be developed.

McKay (R.). **Outbreaks of Verticillium wilt in newly-erected glasshouses.**—*Gdnrs' Chron.*, Ser. 3, cxvii, 3030, p. 24, 1945.

In this communication from the Department of Plant Pathology, University College, Dublin, the author states that in the autumn of 1939 he found *Verticillium albo-atrum* [*R.A.M.*, xxiv, p. 89] prevalent in a tomato house which two years before had been built over an old rhubarb plantation. Formaldehyde treatment reduced infection to negligible proportions. In May, 1940, and again in 1943–4, other outbreaks of the disease [details of which are given] occurred in tomato houses erected over old rhubarb plantations.

All the evidence pointed to the rhubarb roots as the source of infection in the three houses. Infection of rhubarb roots by *V. albo-atrum* can be quite prevalent without being very conspicuous, as permeation of the entire root-stock is seldom thorough enough to cause complete wilt of the whole foliage. Occasional leaves on the crown may be killed, but these are seldom noticed. The only previous records of *Verticillium* on rhubarb appear to be those of Wormald [ibid., viii, pp. 153, 154, 546]. While the erection of tomato houses on rhubarb plantations is probably not very common, rhubarb stools are often brought into propagating houses and occasionally into tomato houses for forcing. The disease may thus easily be introduced on broken pieces of rhubarb which get into the soil.

Pomerleau (R.). **Observations sur les chancres des arbres dans le Québec.** [Observations on tree cankers in Quebec.]—Abs. in *Trans. roy. Soc. Can.*, Ser. 3, xxxviii, p. 164, 1944.

Various species of *Nectria* are the principal agents of cankers in broad-leaved trees in Quebec. The parasitism of the following fungi was demonstrated for the first time: *Poria punctata* on red oak [*Quercus coccinea*], *Diatrype macounii* on sugar maple [*Acer saccharum*], *Pholiota adiposa*, *P. squarrosoides*, and *Polyporus* [*Polystictus*] *pergamenus* on bird cherry, and *Stereum hirsutum* on beech. New hosts for

Hypoxylon blakei are red oak and beech, for *Eutypella parasitica* [*R.A.M.*, xxii, p. 183] bird cherry, and for *Schizoxylon microsporum* elm. The following percentages of trees were found to be infected by cankers in the Duchesnay Experimental Forest: sugar maple 13·3, red maple [*A. rubrum*] 16·7, bird and Pennsylvania cherries 12·3 and 12, respectively, beech 18·7, and aspen [*Populus tremuloides*] 2·9.

ARK (P. A.). **Further evidence of pollen dissemination of Walnut blight.**—Abs. in *Phytopathology*, xxxiv, 10, p. 933, 1944.

In the spring of 1944, many recently pollinated walnuts on both Bordeaux-sprayed and untreated trees in California were completely blighted by *Phytomonas* [*Xanthomonas*] *juglandis* [*R.A.M.*, xxiii, p. 415 and next abstracts], foliar infections and hold-over lesions being absent in the majority of cases. Virulent cultures of the pathogen were yielded by wash water from externally healthy leaves and nuts in the affected orchard. Young Northern California black walnuts at a distance of 25 to 50 ft. from blighted Payne trees bore numerous infections on the foliage from the tree top to the ground line, but again no cankers or diseased buds could be detected. It is therefore assumed that the form of blight under observation is induced by the presence on the leaves of an abundance of contaminated wind-borne pollen originating in the partially blighted catkins of the susceptible Payne variety.

RUDOLPH (B. A.). **The Walnut erinose mite a carrier of Walnut blight.**—Reprinted from *Diamond Walnut News, 1943*, November, 1 p., 2 figs., 1943. [Received December, 1944.]

The variable results obtained in spraying for the control of walnut blight [*Xanthomonas juglandis*] under comparable conditions in California [see preceding abstract] led to an investigation of the possibility of insect dissemination of the disease. Flies, bees, ants, and other insects have been observed colonizing the black, shiny exudate from the lesions, but only two are known to be obligate parasites of the walnut, viz., *Chromaphis juglandicola* and *Eriophyes tristriatus* var. *erinea*, of which the latter, passing the winter in the adult stage, is more likely to act as a vector of *X. juglandis*. In the late summer of 1942, the pathogen was isolated on beef agar from a mite found hibernating beneath the scales of a healthy winter bud and inoculations carried out on seedlings in the greenhouse and on fully grown trees gave positive results. Should the mite be shown by further tests to be a major factor in the spread of blight, the existing spray schedule may have to be broadened to include treatment against this pest, for which the programme now in use does not provide.

SCOTT (C. E.). **Walnut blight today. Difficulties of control explained.**—Reprinted from *Diamond Walnut News, 1944*, March, 1 p., 1944.

Bordeaux mixture 8–4–50, though effectively protecting walnuts from the female flower stage onwards against infection by the overwintered blight [*Xanthomonas juglandis*] bacteria [see preceding abstracts], is open to the grave objection of impairing the quality of the product through foliar injury. Red copper oxide, with which the next best results have been secured, is free from this drawback, but for several years only the yellow form (cuprocide) has been available, and this has now been mostly appropriated for Government use. The problem confronting growers, however, will not be solved even by the development of a 'perfect' spray, since the repeated treatments necessary for complete blight control in rainy seasons would be uneconomic. Investigations concerned with improved remedial measures should therefore not only be directed towards the discovery of a superior bactericide, but also aimed at a reduction of the reservoir of inoculum within the tree.

FOWLER (M. E.) & STEVENSON (J. A.). **A canker and some decay fungi on Mimosa.** —*Phytopathology*, xxxiv, 11, pp. 985–986, 1 fig., 1944.

The branches of mimosa (*Albizzia julibrissin*) trees recently inspected in the District of Columbia bore numerous cankers, which had invariably originated at the base of a dead twig, indicating that the causal organism, *Nectria cinnabarina*, can probably infect the healthy tissues only through an adjacent necrotic portion. The Washington district is near the northern limit for the successful cultivation of mimosa, and winter injury was no doubt a contributary factor in the establishment of the pathogen. *A. julibrissin* appears to have only twice previously been reported as a host of the canker fungus, in Virginia (*Plant Dis. Reptr*, xvi, p. 138, 1932) and North Carolina (ibid., xxiii, p. 85, 1939), but specimens of the disease were collected in South Carolina and Maryland in 1938 by members of the Division of Forest Pathology.

Five species of root-rotting fungi were also concerned in the decline of the trees, viz., *Polyporus* [*Polystictus*] *versicolor*, *P. hirsutus*, *Polyporus tulipiferus*, *Stereum albobadium*, and *Schizophyllum commune*, all apparently new records on *A. julibrissin*. *Eutypella stellulata* occurred in profusion on dead twigs and branches.

STARKER (T. J.). **Preservative treatment of fence posts: 1943 progress report on the Post Farm.**—*Bull. Ser. Ore. Engng Exp. Sta.* 9E, 4 pp., 1 graph, 1944.

On 28th October, 1943, 42 of the posts on the 'farm' for the trial of wood preservatives at the Oregon State College [*R.A.M.*, xx, p. 188] failed to resist the standard test of a 50-lb. pull applied 2 ft. above the ground, compared with 49 in 1942. No failures have occurred to date among the posts given the salt treatment [one tablespoonful of mercuric chloride and common salt in a ¾ in. hole bored at ground-level], though some are badly decayed above the site of insertion. The greatest regularity of annual failures over a 14-year period has been exhibited by the white fir [*Abies concolor*] group, the last two of which succumbed in 1943. In the group composed of western white, sugar, and ponderosa pines [*Pinus monticola*, *P. lambertiana*, and *P. ponderosa*], western larch [*Larix occidentalis*], and western hemlock [*Tsuga heterophylla*], all the 25 posts of the first-named species were found to have rotted, its average life being only 69 months, while the failures among *T. heterophylla*, larch, *P. ponderosa*, and *P. lambertiana* numbered 24, 22, 21, and 19, respectively. All the salt-treated lodgepole pine [*P. contorta*] posts are still sound, while of the untreated dead and live posts of the same species, 17 and 24, respectively, failed during a five-year period.

NARAYANAMURTI (D.) & PANDE (J. N.). **Note on sap stain and its prevention.**—*Indian For. Leafl.*, N. S., Utilis., 68, 11 pp., 1 fig., 1 graph, 1944.

Among the Indian timbers particularly liable to develop sap stain (*Ceratostomella* spp., etc.) under conditions favouring mould growth, including a moisture content exceeding 20 per cent. and a temperature ranging from 23° to 30° C. in the place of storage, are *Bombax malabaricum*, *Ailanthus* and *Erythrina* spp., *Moringa pterygosperma*, *Boswellia serrata*, *Trewia nudiflora*, *Anthocephalus cadamba*, *Sterculia campulanata*, and *Vateria indica*. It is advisable to store logs of these species under water, in which the staining organisms cannot grow owing to lack of oxygen, but where this is impracticable, an end coating may be applied, within 24 hours of felling, consisting of cresylic acid and filled hardened gloss oil (1:10), the entire log being sprayed with cresylic acid and paraffin or crude oil in the same proportions. In preservative experiments with various chemical compounds on *Bombax malabaricum*, *Ailanthus grandis*, *E. suberosa*, and *M. pterygosperma*, 1 per cent. santobrite and 0·25 per cent. lumbasan gave the most effective control. Sap-staining fungi do not appreciably impair the strength of the timber, but their presence is an indication

of poor handling and seasoning practice, and is objectionable, moreover, in all cases where the ornamental qualities of the grain are a primary consideration.

RAMSEY (G. B.) & WIANT (J. S.). **Market diseases of fruits and vegetables: Beets, Endive, Escarole, Globe Artichokes, Lettuce, Rhubarb, Spinach, Swiss Chard, and Sweet Potatoes.**—*Misc. Publ. U.S. Dep. Agric.* 541, 40 pp., 17 pl. (7 col.), 1944.

This publication is the ninth in a series designed to aid in the recognition and identification of economically important pathological conditions affecting fruits and vegetables intended for the market, to facilitate the inspection of these food products, and to prevent losses from such disorders [cf. *R.A.M.*, xxi, p. 316].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lv, 11, pp. 493–498, 8 figs., 1944.

The virus disease of carrots recently described from Victoria [*R.A.M.*, xxiv, p. 134] has also been found in New South Wales, where it has probably been long established.

A certification scheme which aims at providing French bean seed free from bacterial blight (*Bacterium* [*Pseudomonas*] *medicaginis* var. *phaseolicola*) and scald and containing not more than a very small proportion of mosaic and anthracnose [*Colletotrichum lindemuthianum*] has been introduced into New South Wales. The regulations [which are listed] state that only approved varieties, such as Tweed Wonder, Canadian Wonder, Wellington Wonder, Hawkesbury Wonder, and Brown Beauty (Premier), are eligible for certification. The inspectors are to reject the whole of any crop in which bacterial blight is detected. A tolerance of not more than 5 per cent. mosaic and 1 per cent. anthracnose at the final inspection may be allowed, while not more than 3 per cent. impurities will be permitted. Applications for inspection may be rejected if the soil on which the crop is growing is one apt to induce the non-parasitic disorder termed 'scald' [ibid., xxii, pp. 91, 339].

The first symptom of scald is a collapse of the tissue between the main veins and along the edges of the leaflets. The collapsed tissue is light greenish-brown, later yellowish-brown. Withering of the tips or edges of the leaflets or of whole leaflets may ensue, giving the plants a blighted appearance. The affected plants are stunted, their yield is poor, and if many are affected crop failure may result. The disorder is associated with seed raised and sown in highly acid soils (P_H 4·2 to 5). Similar seed, if planted in fertile soils of low acidity, will give vigorous, productive plants. Affected plants have a manganese content several times that of healthy ones. The disease may be avoided on land known to be affected, by planting with seed raised on non-acid soils. Heavy applications of dolomitic lime some months before sowing is worthy of trial.

LYNES (F. F.). **The use of chloropicrin for Beet-seed warehouse fumigation and other purposes.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 413–421, 1943.

During the past three years, the author has successfully used chloropicrin at the rate of 2 to 8 c.c. per sq. ft. for the sterilization of greenhouse soil [*R.A.M.*, xxiii, pp. 114, 373]. The amount required appears to vary with the organic content of the soil, more being needed as the organic material increases. In most cases, it was applied when the moisture content of the soil was such that the soil was, culturally, in an optimum working condition, at the rate of 6 c.c. per injection, to a depth of 8 in., at points 20 in. apart in 10 in. rows, the soil surface being watered immediately to prevent rapid escape of the gas. This method controlled harmful soil micro-organisms (including *Phoma* sp., *Stemphylium* sp., and *Fusarium* sp., as shown by cultures from diseased sugar beets), and insects. As small concentrations of the gas are toxic to living plants, none are left in the greenhouse during treatment. Applications are made in the evening, the building remaining tightly closed overnight.

Planting is effected two weeks after the treatment. Heavier soils may have to be worked to allow the gas to escape. The cost is about $12 per 1,000 sq. ft. If a gas-impervious paper is used instead of a water-seal, a smaller amount of the material may be found equally effective.

COONS (G. H.) & KOTILA (J. E.). **Advances in Sugar-Beet seed treatment.**—Abs. in *Phytopathology*, xxxiv, 11, pp. 990–991, 1944.

Finely ground mercuric chloride (in equal parts with copper carbonate and urea), mercuric iodide, 2 per cent. ceresan, new improved ceresan, and other organic mercury compounds have proved generally superior to copper carbonate or cuprous oxide for the disinfection of beet seed-clusters. Used in a ratio of 1:1 with copper carbonate, 2 per cent. ceresan often conferred more effective and durable protection against damping-off than when applied alone. Preparations giving satisfactory results with whole seed were similarly efficacious with sheared [*R.A.M.*, xxiv, p. 85], which responded favourably, for instance, to dusting with arasan or spergon, the latter, however, requiring a heavier dosage than that ordinarily recommended. 'Pelleting' of the seed is under trial as a means of securing precision in the planting of sheared material, to which standard pill-making techniques are applied to obtain a heavier seed unit of more uniform dimensions. To the coating may be added a fungicide, nutrient, or other substance tending to enhance damping-off control.

CARSNER (E.). **Black streak, a bacterial disease of Sugar Beet in the Pacific Northwest.**—Abs. in *Phytopathology*, xxxiv, 10, pp. 933–934, 1944.

Sugar beets in parts of northern California, western Washington, and the Willamette and Rogue River valleys of Oregon have been suffering of recent years from a bacterial disease involving the leaf blades, petioles, and seed stalks, on which dark brown or black streaks develop. The agent, probably identical with *Bacterium aptatum* [*Pseudomonas aptata*: *R.A.M.*, xv, p. 139], appears to enter the plants through hydathodes and wounds, often invading the tissues damaged by downy mildew [*Peronospora schachtii*]. Field observations suggest the possibility of its transmission through the seed. So far, black streak has not contributed appreciably to the reduction of yields.

MILBRATH (J. A.). **Studies on the control of Bean rust.**—Abs. in *Phytopathology*, xxxiv, 10, p. 936, 1944.

In one district of Oregon where Blue Lake pole beans are extensively grown, rust [*Uromyces appendiculatus*] is of sufficient importance to justify the institution of a control schedule. The pathogen probably overwinters by means of teleutospores, large numbers of which may be found adhering to the used stakes. When contaminated stakes were placed with beans growing in cages in the greenhouse, numerous pycnidial pustules developed in three to four weeks, while unstaked plants remained healthy. The immersion of contaminated stakes in lime-sulphur 1 in 10 or copper sulphate 8 in 100 prevented infection from this source. Weekly applications of kolodust, commencing before aecidiospore formation, were also very effective in combating the disease.

HEWITT (E. J.). **'Marsh spot' in Beans.**—*Nature, Lond.*, clv, 3923, pp. 22–23, 1 fig., 1945.

When peas, broad beans, runner beans, and French (dwarf) beans were grown at Long Ashton in manganese-deficient sand cultures and the pods left on the plants until dry, the seeds showed typical, severe marsh spot [*R.A.M.*, xxi, p. 179] in the case of the peas, a mild to severe marsh spot type of symptom in the broad and runner beans, and no sign of the disease in the case of the dwarf beans. Typical

leaf symptoms were present on runner and dwarf beans, and numerous pods failed to fill after setting.

In a field trial in 1943, peas and broad beans growing in an acutely manganese-deficient market-garden soil showed mild to severe symptoms of the marsh-spot type. In 1944, similar material showed severe marsh spot in peas and mild symptoms in beans. Runner, dwarf, haricot, and tick beans showed no symptoms in the cotyledons. Typical leaf symptoms were severe in dwarf and haricot beans. Spraying the leaves with an aqueous solution of manganese sulphate (0·25 per cent. solution of $MnSO_4 . 4H_2O$) prevented and cured the leaf symptoms.

The results obtained showed that while peas are very susceptible to manganese deficiency as shown by marsh-spot symptoms, broad and runner beans are more resistant; dwarf and haricot beans, which show the most conspicuous leaf symptoms, are most resistant, and may remain otherwise unaffected even when they present severe leaf symptoms.

TRUSCOTT (J. H. L.). **A storage rot of Celery caused by Ansatospora macrospora (Osterw.) Newhall.**—*Canad. J. Res.*, Sect. C, xxii, 6, pp. 290–304, 2 pl., 1944.

The symptoms of a storage rot of celery (*Ansatospora macrospora*) [*R.A.M.*, xxiii, p. 324] grown in muck soil near Thedford, Ontario, are described as follows. Lesions may occur in any part of the plant, but those on the petioles and leaf blades have been noted only late in the storage season, in the last stages of the senescence of the celery. The lesions, which cause over 95 per cent. of the total damage, develop on the tap-root, beginning at the surface and growing inwards and upwards until the attachments of the leaf petioles are entirely rotted away. There may be one to many lesions on the tap-root; they are at first brown, later turning dark green, and finally almost black. Observations made over a period of ten years showed that damage may range from nil to complete destruction. Losses are usually small during the first two months of storage, increasing with time and reaching a maximum within four months.

Pure cultures of the causal fungus are obtained readily from the inner parts of a lesion if it is laid open with a hot knife. Cultures on potato dextrose agar form concentric rings of green and red as the colony grows. The colour is usually green at about 65° F. and red between 80° and 90°. The optimum temperature for growth is between 55° and 65°. Strains of the fungus were isolated that varied greatly in pathogenicity when inoculated into celery stored at 32°; they also varied in growth rate on artificial media and even somewhat in their gross appearance; some strains tended to develop a red colour at all temperatures. Various methods recommended by Newhall [loc. cit.] failed to induce sporulation in both an old and a new culture. It appears established beyond doubt that the fungus is present on or in the celery when it is placed in storage, but it is still not clear whether in the form of mycelium or spores. The fungus appears to be indigenous to Thedford muck soil, developing with about equal severity in celery grown in all fields of the district. The disease does not appear to spread from plant to plant during storage except in very badly rotted celery. It has so far not been possible to find any source of infection other than the soil in which the celery is grown. There is evidence that the disease is connected with senescence of celery. It is a point of practical importance that the first symptoms generally appear only after about eight weeks in storage, towards the end of December, and that Thedford celery sold before that time would suffer little loss from the disease. It was observed that varieties of celery whose general condition was maintained best tended to develop the rot in serious proportions at a later date than those that became senile more quickly. It is pointed out in this connexion that the non-appearance of the disease on celery from the wet field during ordinary storage periods may be a function solely of its maturity.

The only effective control measure so far found is dipping the butts of celery to a

depth of about 1 in. into a 1 in 4,000 watery mixture of phenylmercuric acetate at packing time. Treatment of diseased heads with this chemical reduced the percentage of affected heads in the crates to between 0·4 and 38 (examined between the months of January and March) as compared with between 18 and 100 on the untreated lots. The treated heads bore only a few small lesions and 90 per cent. of them were saleable, while the untreated ones were largely unmarketable.

Cox (C. E.). **The response of Cantaloup-Cucumber grafts to inoculation with Fusarium bulbigenum var. niveum f. 2.**—Abs. in *Phytopathology*, xxxiv, 11, p. 991, 1944.

Cucumbers are not susceptible to cantaloupe wilt (*Fusarium bulbigenum* var. *niveum* f. 2) [*R.A.M.*, xxii, pp. 65, 125]. In grafting experiments with (*a*) cantaloupe scions on cucumber stocks, (*b*) reciprocals, (*c*) cantaloupe scions on cantaloupe stocks, and (*d*) cucumber scions on cucumber stocks, the scion did not affect the reaction of the stock to the pathogen, nor was the relative susceptibility of the scions modified by that of the stock.

Heuberger (J. W.). **Virus disease on the California Wonder Pepper in Delaware in 1943.**—Abs. in *Phytopathology*, xxxiv, 11, pp. 991–992, 1944.

California Wonder [chilli] pepper plants were raised from two seed sources in special houses. In the field, where opportunities for natural infection were equal, those from one source averaged 54 per cent. mosaic compared with less than 1 per cent. for plants from the other locality. No mosaic having been observed in the plant houses, the remarkable disparity in the incidence of infection may denote differential susceptibility to the disease in the field. A new disorder, believed to be of the virus type, was also present, characterized by a continuous yellow discoloration originating at the petiole and extending towards the leaf apex. Infected foliage is readily shed. Fruits already formed at the time of infection later acquire a yellow discoloration, often combined with pitting, while those produced subsequent to the attack fail to mature. Plants from the same seed source developing a high percentage of mosaic were similarly susceptible to the new trouble, which is provisionally named 'yellow leaf'.

Gómez-Moreno (M. L.). **Aráceas de Fernando Póo.** [Araceae of Fernando Po.].—*Ann. agric. Terr. esp. Golfo de Guinea, 1942*, pp. 7–37, 16 figs., [1943. Received February, 1945.]

The following observations of phytopathological interest occur in this study on the indigenous species of Araceae cultivated on the island of Fernando Po, Gulf of Guinea. The corms of *Colocasia antiquorum* Schott (*C. esculenta* Linn.), *Xanthosoma violaceum*, and *X. mafaffa* are subject to a dry rot similar to that referred to by Massee in [*J. Linn. soc. Lond.*, xxiv, p. 45] 1887 to *Peronospora trichotoma* but caused in this instance by *Pythium aphanidermatum*, while *Phytophthora colocasiae* [*R.A.M.*, xx, p. 514] occasionally attacks the foliage.

Osterwalder (A.). **Von einer noch wenig bekannter Bakterienkrankheit an Rebblättern.** [On an as yet little known bacterial disease of Vine leaves.]—*Schweiz. Z. Obst- u. Weinb.*, liii, 16, 282–284, 1 fig., 1944.

A bacterial disease of vine leaves originally described by A. Zschokke from the Palatinate in 1902 and observed sporadically in the vineyards surrounding the Lake of Zürich since 1933, is characterized by large, brown, withered lesions with an abundant sprinkling of small (1 mm. in diameter), angular spots, which on pressure exude myriads of bacteria. The parasitic function of the organisms is evident from their occurrence in the midst of the green tissues and chlorophyll-containing cells, mostly in the intercellular spaces. The bacteria tend to congregate

in the air chambers below the stomata, through which infection presumably takes place. The disease is confined to the older leaves and mostly affects Räuschling vines. The inoculum appears to proceed from the soil in the form of primary spring infections.

BREED (R. S.), MURRAY (E. G. D.), & HITCHENS (A. P.). **The outline classification used in the Bergey Manual of Determinative Bacteriology.**—*Bact. Rev.*, viii, 4, pp. 255–260, 1944.

The outlines of the revised classification to be used in the new (sixth) edition of Bergey's Manual of Determinative Bacteriology [*R.A.M.*, xix, p. 203], which it is hoped to issue in 1945, are set forth and briefly discussed in relation to some other methods of grouping developed since 1900.

RUDORF (W.). **Resistenzzüchtung, ihre Grundlagen und Methoden.** [Breeding for resistance, its principles and methods.]—*Z.PflZücht.*, xxv, 3–4, pp. 190–208, 1943.

Nearly all the 75 papers cited in the bibliography appended to the author's survey and critical discussion of the principles underlying the breeding of plants for resistance to disease and the experimental methods applied to secure that object have been noticed from time to time in this *Review*.

MOORE (W. C.). **Cereal diseases in England and Wales.**—*Ann. appl. Biol.*, xxxi, 4, pp. 360–362, 1944 [1945].

The data obtained during the surveys organized by the Ministry of Agriculture and Fisheries since 1917 show that the chief cereal diseases in England and Wales are to be found among the rusts, foot rots, and stripe diseases, but that none of these cause such heavy economic losses in Britain as they do sometimes in one or other of the main cereal-growing areas of the world.

The most important rust is *Puccinia glumarum*. It is most prevalent on wheat, fairly common on barley, and occasionally present on rye. No alternate stage is known, and its survival depends on the overwintering of the uredospores, which can withstand many degrees of frost, though often killed by high summer temperatures. Temperature is not the only important factor affecting this disease, however; the winter of 1943–4 was mild, yet yellow rust was much less serious in 1944 than it was after the equally mild but wetter winter of 1942–3. Although it is the most injurious of the cereal rusts in Britain, only about once in ten years does it reduce yields by more than an estimated 5 to 10 per cent.

Black rust (*P. graminis*) never causes the devastating losses experienced in North America, and on the whole has very little economic significance. The uredospores are usually killed by winter temperatures, and in most years infection arises from affected barberries. The disease occurs every year on wheat in south-western Wales [*R.A.M.*, xxiii, p. 88], where barberry bushes are common. Very occasionally, as in 1940, it becomes epidemic in many parts during August, in which case yields are affected. These outbreaks seem to occur in years when large numbers of uredospores are blown over from the Continent. The brown rusts of wheat [*P. triticina*], barley [*P. anomala*], and rye [*P. dispersa*] are common and apparently harmless, but oat crown rust [*P. coronata*] leads to insufficiently filled ears and poor yields in Wales and south-western England in some years.

Of the smuts, wheat bunt (*Tilletia caries*) remains the most important, being responsible for the loss or spoilage of thousands of bushels annually. In 1921–2, one-third of the wheat samples examined at the Official Seed Testing Station, Cambridge, were visibly affected. By 1940–1, the figure had fallen to 1·2 per cent. During the last two years, however, incidence appears to have risen [ibid., xxiv, p. 51]. It is thought that soil infection does not occur in England, but this point

needs investigation. There appears to be no record of *T. levis* [*T. foetida*] on growing crops in Britain.

Take-all (*Ophiobolus graminis*) of wheat and barley is troublesome only in wet seasons and on light soils overlying chalk or limestone, or where the rotation is too short. In 1942, a somewhat severe outbreak of *Gibberella zeae* occurred in mid-Wales [chiefly on oats, but also on wheat and barley: loc. cit.], indicating the possibilities of this hitherto rare disease. *Helminthosporium sativum* seems to be uncommon in this country.

Little is known of the effect on yield of barley leaf stripe (*H. gramineum*) and oat leaf spot (*H. avenae*). Both are prevalent everywhere, and both may be responsible for poor stands, especially in northern and western areas, but really serious losses appear to occur only in isolated instances.

Bad infection by mildew (*Erysiphe graminis*) generally follows a mild winter and a dry spring, and under these conditions, particularly if yellow rust is also severe, deaf ears and shrivelled grain may be expected. Ergot (*Claviceps purpurea*) [ibid., xxii, p. 94] is generally found in small quantities in descending order on rye, wheat, barley, and oats, but the disease is not important. It becomes prominent only when cool, wet weather prolongs flowering. In the past 25 years these conditions have been fulfilled only on a few occasions, notably in 1927 and 1928.

DILLON WESTON (W. A. R.). **Looking back and looking forward. (A retrospect of cereal diseases in East Anglia in the past 21 years.)**—*Ann. appl. Biol.*, xxxi, 4, pp. 366–370, 1944 [1945].

During the period from 1930 to 1940, land in East Anglia was planted too heavily to wheat, with the result that the soil became sick with *Ophiobolus graminis*. To-day, take-all is no longer a major problem, though it sometimes causes difficulty on the lighter-textured soils and in cereals which follow broken-up old grassland.

It is not at present known whether leaf blotch of barley (*Rhynchosporium secalis*) [*R.A.M.*, xxi, p. 154] affects yield or malting quality. The fungus is not seed-borne. Infection is usually more marked in a wet May, and it appears to carry over from year to year on volunteer barley, but the fungus also attacks various grasses, such as cocksfoot [*Dactylis glomerata*], wall barley [*Hordeum murinum*], couch [*Agropyron repens*], soft brome [*Bromus mollis*], and sterile brome [*B. sterilis*].

In seed-disinfection trials at Cambridge in 1942 harvesan completely controlled barley leaf stripe [*Helminthosporium gramineum*] and wheat bunt [*Tilletia caries*] and gave only 0·37 per cent. oat leaf spot (*H. avenae*). In 1943, harvesan gave 0·81 per cent. wheat bunt and ceresan 0·75 per cent., while the former and lunasan [ibid., xxii, p. 56] each completely controlled oat leaf spot.

If the scheme started in 1943 for the official approval of fungicides [ibid., xxiv, p. 25] is to maintain its prestige, the standard of efficiency demanded must be strictly preserved; it must be assessed by field tests; and the results must be made available to farmers. This would necessitate setting up an official testing station.

DENNIS (R. W. G.). **Cereal diseases in Scotland.**—*Ann. appl. Biol.*, xxxi, 4, 370–374, 1944 [1945].

After pointing out that in most of Scotland the most important oat disease is still the seedling-blight phase of leaf stripe (*Pyrenophora avenae*) [*R.A.M.*, xiv, p. 690], the author refers to the practice of seed treatment in Scotland, and states that in 1932, only 18 months after the first published mention of dry seed-dressing in *Scot. J. Agric.*, 266,795 lb. of ceresan were sold in Scotland, enough to treat 2,134,360 bush. seed-grain. Almost the whole of this was certainly used on oats. By the spring of 1933, five Scottish firms were advertising machines for applying dry disinfectants to oat seed.

Ceresan was first advertised in *Scot. Fmr* on 31st January, 1931, agrosan G on

14th January, 1933, and leytosan CC on 25th February, 1933. Harvesan appeared on the Scottish market at about the same time as it did in England. It is not possible to give exact figures for the total sales of these materials, but it would seem that their use continues at a satisfactory level.

While seed-dressing is general in the west and to some extent in the north of Scotland, little benefit is derived from the practice on the best Lothian soils and in other favoured parts of the east coast, even with heavily infected seed.

Some species of *Fusarium*, particularly *F. nivale* [*Calonectria graminicola*] are also partly responsible for low brairds of oats sown under poor soil conditions. When inoculated seed was sown in the ground out-of-doors on 24th February at a soil temperature of 3° C., *F. culmorum* had little effect, but *C. graminicola* reduced the braird from 66 to 40 per cent.

Gibberella zeae has also been somewhat prevalent in recent years on ripening oats and especially on straw damaged by take-all [*Ophiobolus graminis*] or by insects in the south-western parts and the islands. In inoculation tests, it had no effect on seedling growth or emergence.

In addition to the injury caused by seed-borne *Fusarium* spores, there is evidence that in the west of Scotland and probably in cold, wet soil elsewhere, considerable loss of oat seed is due to rotting by soil fungi. A field experiment indicated that this can be checked to some extent by organo-mercury seed dressings.

The oat smuts, *Ustilago avenae* and *U. kolleri*, are now present in only a few backward districts, especially in the north.

Stem rust (*Puccinia graminis*) is not uncommon on oats in the Tweed valley, where the barberry is a common hedge plant. Elsewhere, it is sporadic and of no importance. In most areas, oats are free from crown rust (*P. coronata*), but extensive outbreaks still occur at long intervals, the most recent one of any importance being in July, 1933. As *Rhamnus* bushes are not native to Scotland, and the uredospores do not appear to survive the winter, the outbreaks seem to originate from wind-blown uredospores from some area where *Rhamnus* is prevalent. The relative freedom from this disease appears to be due to the absence of the alternate host and the obstacles to the spread of inoculum imposed by natural barriers.

As regards wheat diseases, bunt [*Tilletia caries*] is scarcely ever seen, even when infected, untreated seed is sown. *P. triticina* is also unknown. *P. glumarum* can be found if hunted for, and in 1943 was alarmingly conspicuous. The outbreak caused less damage than was expected, but in many instances it led to a reduction of yield estimated at 8 bush. per acre.

WALTERS DAVIES (D.). **Cereal diseases in mid-Wales.**—*Ann. appl. Biol.*, xxxi, 4, pp. 374–376, 1944 [1945].

Of the cereal rusts found in mid-Wales, crown rust (*Puccinia coronata*) is the most important and destructive, appearing every year on oats, rye grass [*Lolium perenne* ?and *L. multiflorum*], and other grasses. Incidence is largely determined by climatic conditions, but with oats time of sowing and the practice of manuring affect severity of attack. Late-maturing crops generally sustain the heaviest infection, and crops well supplied with nitrogenous fertilizers suffer more than crops growing under more natural conditions. Epidemics occur at periodic intervals, and severe outbreaks arise once every nine or ten years, when the yield of susceptible varieties may be reduced to 5 cwt. per acre. All commercial varieties are affected, but the Scotch Potato oat and its related varieties, Castleton and Pure Line potato, are extremely susceptible.

Next in order of importance is yellow rust [*P. glumarum*] which, with mildew (*Erysiphe graminis*), causes considerable damage to wheat and barley. As regards smuts, all the common forms are present, *Tilletia caries* on wheat, *Ustilago avenae* on oats, and *U. hordei* on barley being the most important. *Ophiobolus graminis*

and its var. *avenae* are widely distributed, presumably owing to the high rainfall and the frequency with which cereals are now grown in a rotation. A survey of 30 farms where wheat had failed showed that take-all was more prevalent in crops grown after grass than in those grown after stubble. It was associated with all wheat failures, but there was evidence that other factors may be responsible for loss of crops. Only *O. graminis* var. *avenae* was found in 1943. Wheat and oats can tolerate infection and grow vigorously. Typical mycelial growth was often observed on the roots of matured plants in the absence of basal infection of the tillers. Lime encouraged take-all incidence.

Helminthosporium avenae does considerable damage to oats in the seedling stage, many crop failures being attributed to it. Ear blight caused by *Gibberella zeae* was frequent on wheat, oats, and barley in the exceptionally wet seasons of 1942 and 1943.

BROOKS (F. T.). **Biological specialization in the cereal rusts.**—*Ann. appl. Biol.*, xxxi, 4, pp. 362–366, 1944 [1945].

That eight physiologic races of *Puccinia triticina* should have been first discovered in England in spite of the apparent absence of the aecidial stage on *Thalictrum* may perhaps point to genic mutation in the uredospore stage being an important factor in the evolution of new races.

From 1931 to 1934 Mrs. Bawden examined many collections of *P. glumarum* on wheat from different parts of the country and showed that several races were involved [cf. preceding abstract]. The results of her work, however, were not published. In 1931 and again in 1932, single collections of yellow rust on wheat in England were determined (in Canada) as race 4. Yellow rust on wheat at Cambridge, sent to Germany in 1933, proved to be race 4, while another collection, sent in 1934, was race 6. In 1943, during an epidemic outbreak, Desprez 80 wheat was badly attacked in southern England, but only slightly affected in the north, indicating the presence of two races. Whether mature plant resistance occurs is uncertain, but Little Joss wheat, which is sometimes heavily infected in February, becomes markedly free from infection as maturity approaches.

At least 30 races of *P. anomala* [*R.A.M.*, xviii, p. 666] have been identified; of these, four were first discovered in Britain, where one is widely distributed [ibid., xviii, p. 387].

Attention is drawn to some of the difficulties met with in determining the physiologic races of cereal rusts. Genetic purity of the differential varieties and of the rust cultures is essential. Seed stocks of some varieties received from abroad may be impure, and it may take one or more seasons to eliminate rogues. As, however, cereals are mostly self-pollinating, once a pure stock has been obtained the risk of out-pollination is small, especially if the ears are bagged before flowering. The only sure way to secure a pure rust culture is to establish it from a single uredospore, as more than one race may be present on a leaf collected in the field. Pure cultures must be kept in isolation from one another, e.g., in cellophane cylinders or cages, at a temperature tolerated by the rust. With *P. glumarum*, it may be necessary to store the spores at a low temperature before hot weather intervenes. Workers must be on their guard against contamination of pure cultures by extraneous races. Few glasshouses can be kept altogether free from insects, and there is always a risk that spores may be transferred when the stock cultures are exposed. Host varieties should be inoculated at the same stage of seedling development, usually on the first or second leaf, and should be covered with bell-jars for 48 hours. Each rust has an optimum temperature for development, e.g., 22° to 25° C. for *P. graminis* and 13° to 16° for *P. glumarum*, and at some centres the tests are conducted in temperature-controlled glasshouses. Where these are not available, the work should be done at periods when the range of temperature

approximates to that of the optimum for the particular rust being studied. Tests must be made when the light is good at Cambridge; it is useless to test physiologic races during winter, because of the long spells of dull weather. Further, it is advisable to test as many races as possible of one rust simultaneously, in order to eliminate environmental differences; this is particularly important where there is no rigid temperature control.

GARRETT (S. D.). **The take-all disease of cereals.**—*Ann. appl. Biol.*, xxxi, 4, p. 376, 1944 [1945].

Growth of the runner hyphae of *Ophiobolus graminis* [*R.A.M.*, xxiii, pp. 59, 130, 338; xxiv, p. 95] along the host roots is favoured by good soil aeration and an alkaline soil reaction. Further, light-textured soils also favour the disease because they are usually poor in nitrogen and often in other plant nutrients. Cereals in soil well supplied with nutrients can produce new secondary roots to replace those destroyed by the fungus, but deficiency of nitrogen, phosphorus, or potassium will curtail this power of recovery. The widespread outbreaks observed in the Southern Advisory Province in 1943 may have been partly due to leaching-out of nitrates by the heavy January rainfall. A coincidence of patches of take-all with low-lying areas flooded in winter may perhaps be due to such leaching-out of nitrate nitrogen.

Survival of the fungus in root and stubble residues mainly depends on an adequate nitrogen supply from the surrounding soil. In such conditions, *O. graminis* forms new branch hyphae, which can explore the non-eroded cell tissue, enabling the fungus to survive.

WATSON (I. A.) & WATERHOUSE (W. L.). **A third factor for resistance to Puccinia graminis tritici.**—*Nature, Lond.*, clv, 3929, p. 205, 1945.

A third factor for resistance to *Puccinia graminis tritici* race 34 has been found by the authors in the Kenya wheat varieties. In New South Wales, this race formed the bulk of the stem-rust inoculum used in breeding work until 1941, and Kenya 743, 744, and 745 were highly resistant to it. Genetical studies showed that the resistance of each variety was, apparently, governed by a single major factor. Work on F_3 lines showed that in 744 the factor is the same as that for resistance to races 17, 36, and 56, while the one in 745 is K_1, these factors being inherited independently [*R.A.M.*, xxiii, p. 95]. These factors are not allelic with the one present in 743, because when this variety was crossed with 744 and 745 in turn and F_2 seedlings tested with the standard race 34, approximately 15 were resistant while one was susceptible. Although a new rust capable of attacking 743 has recently arisen in Australia, 744 and 745 remain resistant to it. In these last two varieties it would seem that the same gene gives resistance to both the new and the old rusts. Other varieties known to possess a single major gene for resistance to the standard race 34 were crossed in turn with each of these three varieties, and on a basis of the segregations of F_2 and F_3 seedlings their relationship to them was determined. So far, 744 is alone in one group, but the other two groups are well represented. All varieties which fall into the group with 743 are susceptible to the new rust which attacks this variety. Included in the 745 group are varieties with a single factor for resistance derived from Gaza wheat (*Triticum durum*).

DARLEY (E. F.) & HART (HELEN). **Effect of nutrient levels and temperature on the development of Puccinia graminis tritici.**—Abs. in *Phytopathology*, xxxiv, 12. p. 998, 1944.

Wheat seedlings grown at low nutrient levels responded to inoculation with *Puccinia graminis tritici* by the development of severe chlorosis, poor uredospore germination, and relatively mild types of infection, whereas at high nutrient levels there

was virtually no chlorosis and the other conditions were reversed. In adult plants, a high nutrient level delayed maturity by up to three weeks, but barely affected reaction to stem rust. Mycelial production and sporulation in seedlings were most profuse at 85°, and scantiest at 65°. Both seedlings and fully grown plants of one of the Kenya wheats were susceptible to several races of *P. g. tritici* at 85°, but resistant at 72° and 65°. Newthatch seedlings were flecked by race 17 at 85°, but seemed immune at the two lower temperatures.

MINZ (G.). **Control of rust in Wheat by sulphur dust (2nd trial).**—*Hassadeh*, xxv, 3–4, p. 107, 1945. [Hebrew.]

In the second trial of dusting wheat with superfine Gaza sulphur for the control of rusts [*R.A.M.*, xxiii, p. 336], particularly stem rust (*Puccinia graminis*), Florence (Morocco origin) was treated as soon as the disease appeared, five treatments being given from 2nd April to 3rd May, 1944. Heavy rust occurred that year. The dusted plants yielded an average of 284 and the undusted 201 kg. per 0·1 ha., respectively. The increase in yield due to the sulphur treatment was thus 41 per cent., and the loss from stem rust 29 per cent., respectively. The increase in weight of 1,000 seeds ranged from 34 to 42 gm. (23 per cent.). The amount of sulphur applied by a hand-duster was relatively large in order to ensure thorough control (70 kg. per $\frac{1}{10}$ ha. for the five treatments).

The following observations of interest may be added. The dusted plants matured ten days earlier than the undusted, the height of straw of the former being 150 as compared with 100 cm. for the latter. The kernels from untreated plants bore yellow spots up to an average of 24 per cent. as against only 0·2 per cent. from the dusted. An analysis of the flour revealed less protein and gluten and inferior gluten and baking quality.

FANG (C. T.). **Physiologic specialization of Puccinia glumarum Erikss. and Henn. in China.**—*Phytopathology*, xxxiv, 12, pp. 1020–1024, 1944.

Nine physiologic races of *Puccinia glumarum* [*R.A.M.*, iii, p. 266; x, p. 713; xiii, pp. 689, 757; xviii, p. 734] were identified in 43 collections, mostly from Yunnan Province, China, separation being based on differences in infection type on seven varieties of wheat, namely, Carsten V, Heine's Kolben, Vilmorin 23, Hybrid 128, 9H77 Carina, and Michigan Amber, and one of barley, Heil's Franken. The races, which are distinct from any hitherto known, are designated C1 to 9 consecutively. C1 is much the most virulent of the new races and second in prevalence to C3 in the Kunming district. Of 1,487 varieties tested for their reactions to these two races over a four-year period, 30 were either immune or highly resistant. All but two of the resistant varieties were of foreign origin.

SIBILIA (C.). **Sulla resistenza alle ruggini di alcuni Grani di montagna.** [On the resistance to rusts of some mountain Wheats.]—*Ital. agric.*, lxxix, 12, pp. 638–641, 1942. [Received 1945.]

In most years, infection of wheat by yellow rust (*Puccinia glumarum*) becomes general in central Italy between the middle and the end of April and in the north 10 to 15 days later; then comes brown rust (*P. triticina*); and finally, black rust (*P. graminis*) develops almost everywhere in these regions towards the end of May. In 1942, however, temperatures in April and most of May were low, and yellow rust was not found in central Italy until 20th May; spread was slow. In the few acres in which infection reached epidemic proportions, both yellow and black rusts were found together, a very unusual occurrence, but as the temperature rapidly rose, conditions became favourable to black rust, and in the hill regions, where maturation is delayed, losses reached up to 50 per cent.

The season was also unfavourable to brown rust. Attacks did not become intense

until the middle of June and even then they were less serious than usual, maturation having occurred some days earlier than in most years.

Observations over four years showed that 16 strains of Est (Mattin) wheat, viz., Vd 4, Cr. 1139, 18a, 18/2, 39a, 39/17, 72/35, 72/17, 72/23, 94/5, 94/11, 99/5, 99/9, 110/3, 108/9, and 108/2, and six of Andriolo, viz., 10/12, 12/5, 49/3, 34/6, 36/14, and 12/38, were almost immune from yellow rust. With regard to brown rust, as in previous years, a few strains were severely attacked, but on the whole damage was regarded as of limited importance where the strain was resistant to the other two rusts.

With regard to *P. graminis*, observations over a number of years showed that the following were highly resistant, viz., Est: Vd4, Cr. 1139, 72/35, 72/17, 72/23, 94/5, 94/11, 99/9, 39/17, 108/2, 18/2, and 18a; Andriolo, 12/5, 49/3, and 36/14.

The observations made also showed the importance of the anthocyanic pigmentation in relation to resistance, particularly resistance to *P. graminis*. This is known to be a very important factor in resistance to cold, and therefore is of special importance in mountain wheats. The effect of the anthocyanic reaction of the tissues is clearly seen in the development of the rust lesions. Very often, some of the strains, e.g., Est: 72/17, 72/73, 72/35, Cr. 1139, and Andriolo 10/12, showed numerous infection centres on the sheaths and the last internode, but these centres, surrounded by tissues in which anthocyanin immediately formed, remained punctiform, whereas in very susceptible varieties they developed into large, lacerated areas.

Anthocyanic pigmentation, however, though important, is not the only factor in the resistance to *P. graminis* shown by these strains. Some lack the reaction entirely, e.g., Andriolo 34/6, and yet are appreciably resistant. Some have it and are moderately susceptible, e.g., Est 39/a, 94/5, and 110/3. Further work will be carried out on this point.

Of great importance with regard to resistance is the site of the lesions [*R.A.M.*, x, p. 368], particularly the behaviour of the last internode. The presence of lesions on the sheaths does not greatly affect yield, whereas heavy infection of the top internode does. Est 94/5, 94/11, 99/9, and Cr. 1139 showed scarcely any lesions on the last internode; those that were present were punctiform, did not enlarge, and were mostly surrounded by a halo of tissues containing abundant anthocyanin. Infections on the sheaths were more numerous.

It is concluded that most of the strains studied showed marked resistance to yellow rust, less to brown rust, and satisfactory resistance, at least on the part of 10 strains, to black rust. These 10 strains (all the Est strains listed above as highly resistant to *P. graminis* except 39/17 and 18a) having undergone testing in different localities for several years, must, presumably, have successfully overcome attack by the most virulent and widespread physiologic races of *P. graminis*.

WELLS (D. G.) & SWENSON (S. P.). **Inheritance and interaction of genes governing reaction to stem rust, leaf rust, and powdery mildew in a spring Wheat cross.**—Abs. in *J. Amer. Soc. Agron.*, xxxvi, 12, pp. 991–992, 1944.

The F_2, F_3, and F_4 progeny of a cross between a hard red spring wheat selection of H44-Reward × Baringa (HRB) and a soft white spring wheat selection of Hard Federation × Dicklow (HFD) were investigated at the Washington State College for their reactions to stem and leaf rusts [*Puccinia graminis* and *P. triticina*] and powdery mildew [*Erysiphe graminis*]. HRB was moderately resistant to *P. graminis* and equal to H44 in resistance to *P. triticina* and *E. graminis*, while HFD was susceptible to all three diseases.

Powdery mildew occurred spontaneously in the nursery, and epidemics of the rusts were induced by the introduction of two prevalent physiologic races of *P. graminis* and four of *P. triticina*. The response to the former rust was apparently

governed by two or three gene pairs, while single gene pairs, Lm lm and Ms ms, were evidently concerned in the reaction to the other two diseases. From analyses for associations between genes for reaction to the three diseases under investigation, a cross-over value of 20·8±2 per cent. was established between the *P. triticina* and *E. graminis* genes. Significant linkages were found for the associations stem rust versus leaf rust and stem rust versus mildew, but these two connexions were not corroborated by subsequent data from a related cross.

REICHERT (I.). **On the disease resistance of wild Emmer.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 179–183, 1 fig., 1944.

In two field experiments conducted in the central coastal plain of Palestine in 1924–5 and 1927–8, seeds of at least three varieties of wild emmer (*Triticum dicoccoides*), viz., *spontaneo-nigrum*, *kotschyanum*, and *fulvo-villosum*, dusted with dry bunt (*Tilletia tritici*) [*T. caries*] spores from Jiljilie wheat (*T. durum* var. *melanops*) gave rise to a high proportion of diseased plants (55 out of 77, 3 out of 6, 4 out of 5, and 6 out of 6 in four tests).

It was long assumed that the tetraploid (28-chromosome) wheat species, including *T. durum*, were resistant to bunt, but observations show that this axiom is not universally applicable. Wild emmer comprises, according to Jacubziner (*Bull. appl. Bot. Select., Suppl.* 53e, 275 pp., 1932), no less than 19 varieties, so that besides the above-mentioned three susceptible, there may well be a number of resistant ones. Another explanation of the discrepancy between the reactions of emmer to the disease in Palestine and elsewhere may lie in the existence in the former country of particularly virulent physiologic races of the pathogens capable of breaking down the normal resistance of the host.

PETERSON (R. F.) & MEREDITH (W. O. S.). **Agronomic quality characteristics of Carleton durum Wheat grown in the durum Wheat area of western Canada.**—*Sci. Agric.*, xxv, 2, pp. 107–111, 1944.

Mindum has long been the leading variety in durum wheat, but though outstanding agronomically it was a little deficient in straw strength and rust resistance. Carleton was obtained by crossing Mindum with Vernal Emmer and back crossing with Mindum. While the yield of Carleton is slightly less than that of Mindum, it is distinctly superior in strength of straw and resistance to stem rust [*Puccinia graminis*], though somewhat more susceptible to kernel smudge [*Alternaria* and *Helminthosporium* spp.: *R.A.M.*, xvii, p. 448]. Both varieties are highly resistant to leaf rust [*P. triticina*] and root rot [*Pythium* spp.] and moderately susceptible to bunt [*Tilletia caries* and *T. foetida*]. The macaroni quality appears to be equal if not superior to that of Mindum.

GLYNNE (MARY D.). **Eyespot, Cercosporella herpotrichoides Fron, and lodging of Wheat.**—*Ann. appl. Biol.*, xxxi, 4, pp. 377–378, 1944 [1945].

Wheat eyespot (*Cercosporella herpotrichoides*) [*R.A.M.*, xviii, p. 448] is found in England, Wales, and Scotland, increasing from west to east as the frequency of wheat- and barley-growing becomes more pronounced. To estimate the loss sustained through the disease, it is necessary to know the direct loss caused by eyespot itself, and the indirect loss caused by lodging, as well as the distribution and percentage of the disease in the wheat crops of the country and the percentage area lodged by eyespot each year.

Pot tests in which infected plants were compared with healthy ones showed that whereas almost all the latter survived, the loss through death was 23 per cent. at a low level of fertility and 11 per cent. when nitrogen was supplied. The loss in total yield of grain was 44 and 16 per cent., respectively.

In 1943, eyespot in a heavily infected field was reduced by 10 per cent. by

autumn spraying with sulphuric acid. With the decrease in eyespot there was an increase in yield of 18 per cent., equivalent to about 3 cwt. grain per acre. This result may have been partly due to reduction of weeds by the treatment. In small-scale field tests by Wendy Dion in which weeds were removed, spraying with sulphuric acid in spring gave an increase of 33 per cent. total grain associated with a decrease of 31 per cent. straws severely infected by eyespot.

In another experiment, some 20,000 straws were obtained at harvest; the healthy ones and those with superficial lesions yielded twice as much grain per straw as did the severely affected ones. On this basis, the loss in yield would be 0·5 per cent. grain for every 1 per cent. straws severely infected at harvest, so that a field with 60 per cent. badly diseased straws would lose about 30 per cent. of its grain. The general evidence indicates that this is a reasonable estimate. Further loss is entailed by the fact that the grain produced by diseased plants is of small size, so that there is more tail corn from affected than from healthy plants.

Loss due to lodging, independently of eyespot, was determined by inducing it at different dates before harvest. The earliest lodging gave the greatest loss, the figures being 54 per cent. of the grain in plots lodged 6½ weeks before harvest and 29 per cent. four weeks later. In a later trial, birds increased the loss from lodging to 74 per cent. Uninfected crops which lodge tend to fall in one direction and can be harvested by working one way with the binder, but when crops lodge as a result of eyespot, they fall in all directions, and must be harvested by scythe.

Wheat yields in England could be greatly increased by a more generous use of fertilizers, but farmers are afraid of lodging. This danger can be obviated by using short- or stiff-strawed varieties. The chief advantage of these, however, is lost unless they are manured up to a level of soil fertility at which long-strawed wheats are likely to lodge. The best means of controlling eyespot is by good rotations; ley-farming, in which arable and grass alternate every few years, would seem excellent for the control of both eyespot and take-all [*Ophiobolus graminis*]. Sulphuric acid spraying of eyespot-infected crops cannot yet be recommended for general use.

Two less serious diseases resembling eyespot are sharp eyespot due to *Corticium solani* [ibid., xxii, p. 426], which is common, but seldom severe, and white straw disease, caused by *Gibellina cerealis* [ibid., xvi, p. 801], so far found in this country only in one field, at Rothamsted.

PISAREV (V. E.) & MALINOVSKAYA (Mme E. S.). **The breeding of spring Wheats resistant to Fusarium.**—*Тр. Инст. Зерн. Хоз. нечернозём. Полос.* [*Trans. Inst. Grain Fmg non-black-soil Distr.*], *1941*, 10, pp. 35–58, 1941. [Russian. Abs. in *Plant Breed. Abstr.*, xv, 1, pp. 39–40, 1945.]

The infestation of the soil round Moscow by *Fusarium avenaceum*, *F. culmorum*, and *F.* spp. of the *Elegans* section, the first-named being the most virulent, constitutes a serious obstacle to spring wheat cultivation. The fungi may either be present in the seed at sowing time or attack the young shoots on emergence. Prelude and certain varieties from eastern Siberia were found to be resistant to the former type of infection and Hybrid 170 (the offspring of a resistant local Norwegian wheat and the American Blue Stem) and Diamond to the latter, while Milturum 321 was highly resistant to the second and moderately so to the first. In the resistant varieties infection uniformly occurred at the base of the plants, but never extended beyond the coleoptile and did not involve the roots. In the case of susceptible varieties, the plants were either killed or made poor growth without tillers, depending almost exclusively on their primary roots and often devoid of grain in the ear. Early sowing at low temperatures, the use of large seeds, and careful attention to cultural methods are important factors in the reduction of *Fusarium* infection.

[An expanded summary of this paper, filed at the Imperial Bureau of Plant Breeding, Cambridge, presents in tabular form some further information on the effect of the pathogens on germination, the relation of virulence in *F. avenaceum* to soil temperatures, the comparative germinative capacities of resistant and susceptible varieties, and other aspects of the problem.]

HONECKER (L.). **Resistenzzüchtung gegen Mehltau und Rost bei Gerste. Erfahrungen und Ergebnisse vierjähriger Züchtungsarbeit.** [Breeding Barley for resistance to mildew and rust. Observations and results of four years' breeding work.]—*Z. PflZücht.*, xxv, 3–4, pp. 209–234, 1943.

Much of the available information on the work proceeding at the Weihenstephan (Bavaria) Plant Breeding Station in connexion with the breeding of barley for combined resistance to yellow and dwarf rusts (*Puccinia glumarum* and *P. simplex* [*P. anomala*]) and mildew (*Erysiphe graminis* var. *hordei*) [*R.A.M.*, xx, p. 251; xxiii, p. 11] has already been noticed from other sources. In general, the rusts caused little damage on mildew-susceptible varieties, being largely suppressed by their less exacting antagonist. This is particularly true of dry regions, where conditions are in any case unfavourable to rust development and highly conducive to that of mildew. Heavy epidemics of rust may be induced, however, by the elimination of *E. g. hordei* through the widespread cultivation of resistant varieties, thereby removing a natural check on the former pathogens.

The simultaneous occurrence on field plants of mildew, yellow rust, and dwarf rust may, in certain cases, confer a 'pathogenic equilibrium', so that the aggregate injury is relatively slight, even though individuals of the same variety may be severely attacked as seedlings in the greenhouse. Under comparable outdoor conditions, however, the yield reductions in partially resistant varieties may be much heavier in consequence of the unimpeded development of a single parasite. Thus, selections that are not fully resistant to all the members of a disease complex are liable to much larger yield fluctuations than varieties characterized by marked juvenile susceptibility but possessed of stable field resistance.

'Synthetic' breeding for resistance to the three diseases under investigation should therefore form the basis of further experimental work. The separate treatment of the various problems involved would merely delay the achievement of the primary objects of increased production and improved quality.

MINZ (G.). **On the occurrence of Ustilago nigra on Barley in Palestine.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 205–206, 1944.

The author observed that loose smut of barley is more prevalent on Arab farms than on Jewish ones where the seed is always treated with seed-dressings. Nevertheless, *Ustilago nuda*, to which the loose smut was supposed to be due, is not amenable to control by this method, whereas *U. nigra* is. Of 31 samples of infected barley ears from various districts in Palestine, 20 yielded spores germinating slowly with branched mycelia corresponding to *U. nuda* and 11 spores germinating abundantly and rapidly produced sporidia like *U. nigra*. The different species were not confined to special varieties of barley or to special districts. In the presence of *U. nigra* the application of seed-dressings to barley seeds assumed increased importance.

REICHERT (I.), MINZ (G.), & PALTI (J.). **Trials for the control of covered smut of Barley by seed dressings.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 171–174, 1944.

In six experiments between 1940 and 1943 designed primarily to compare the efficacy against barley covered smut (*Ustilago hordei*) of agrosan G (2 and 2·5 gm. per kg. seed-grain) and yellow sulphur dust (4 and 8 gm.), the former gave uniformly satisfactory results, reducing infection from 100 to a maximum of 1·9 per

cent., while the latter was effective only in milder cases. On the basis of these trials, therefore, G. Howard Jones's general recommendations for the treatment of *U. hordei* with sulphur [*R.A.M.*, xiv, p. 159] cannot be endorsed. Under Palestinian conditions it should be used only where the seed is reasonably free from contamination. A local mercurial product, caspan, which was applied in some of the tests as a sprinkle (75 gm. in 1·5 l. water per 50 kg. seed), proved inferior to the dusts in the control of covered smut.

COCHRAN (G. W.), JOHNSTON (C. O.), HEYNE (E. G.), & HANSING (E. D.). **Inheritance of reaction to smut, stem rust and crown rust in four Oat crosses.**—*J. agric. Res.*, lxx, 2, pp. 43–61, 4 figs., 1944.

The inheritance of resistance of oats to a mixture of races of *Ustilago avenae* and *U. levis* [*U. kolleri*], *Puccinia graminis* physiologic races 2 and 8, and *P. coronata* physiologic race 1 was studied in the crosses Richland-Fultex × Fulghum-Victoria and its reciprocal, Fultex × Richland-Fulghum, and Anthony-Bond × Richland-Fulghum in the field and in the greenhouse. The reaction of the first three crosses was similar, but the fourth differed in accordance with the genetic contribution of the Anthony-Bond parent.

Transgressive segregation for smut susceptibility was observed in the first three crosses. The parents showed high resistance to infection and the reaction of the F_2 and F_3 indicated that each parent carried a dominant factor for resistance; when both these factors were absent in the hybrid the plant was susceptible. A similar condition obtained in the Anthony-Bond × Richland-Fulghum cross, except that there was one dominant factor for high resistance to smut and one for moderate resistance.

Resistance to *P. graminis* was dominant in all four crosses and was apparently determined by a single factor.

The reaction to *P. coronata* of the crosses involving Fulghum-Victoria and Fultex was governed by a single factor dominant for resistance. The reaction of Anthony-Bond × Richland-Fulghum was more complex and was controlled by the interaction of four factor pairs, two sets of dominant complementary factors, one set, dominant complementary genes, carried by Anthony-Bond, the resistant parent, and the other set, dominant complementary inhibitor genes epistatic to the genes for resistance, carried by the susceptible Richland-Fulghum parent. The expected F_2 ratio was 35 fully resistant: 48 moderately resistant: 52 intermediate: 121 fully susceptible, and the expected F_3 was 7 lines breeding true for resistance, 128 segregating, and 121 true for susceptibility. The observed ratio in both F_2 and F_3 was statistically near to these. A further complication was that, in the seedling stage only, in the greenhouse, different effects were observed in phenotypes of different heterozygous conditions.

No association was observed between the factors determining the reaction to the different diseases.

WELSH (J. N.). **History, description, distribution and performance of Ajax and Exeter Oats.**—*Sci. Agric.*, xxv, 2, pp. 96–106, 2 figs., 1944.

Ajax, the product of a cross made in 1930 between Victory and Hajira, is resistant to the common races of stem rust [*Puccinia graminis*] found in Canada, moderately resistant to crown rust [*P. coronata*] in the mature-plant stage, and has a fairly high degree of resistance to smut [*Ustilago avenae* and *U. kolleri*] and halo blight [*Pseudomonas coronafaciens*]. It is an early maturing variety, and is rapidly becoming of major importance in Western Canada. Exeter, derived from Victory and Rusota (both resistant), is resistant to the common races of stem rust and considerably so to halo blight but susceptible to other diseases. Some 3,500 bush. seed was distributed to farmers in the winter of 1943–4.

HANSING (E. D.) & MELCHERS (L. E.). **Standard and new fungicides for the control of covered smut of Sorghum and their effect on stand.**—*Phytopathology*, xxxiv, 12, pp. 1034–1036, 1944.

The stand of pink kafir sorghum artificially inoculated with covered smut [*Sphacelotheca sorghi*] at the rate of 1 gm. spores per 200 gm. seed-grain was increased in a trial at the Kansas Agricultural Experiment Station in 1943 by seed treatment with spergon, arasan (2 and 3 oz. per bush., respectively), new improved ceresan, DuBay 1452-C (7·7 per cent. ethylmercury-*para*-toluene sulphonanilide), both at ½ oz., and coronia coppercarb (3 oz.). These preparations increased the emergence percentage from 34 to 71, 67, 62, 61, and 57, respectively, while simultaneously reducing the incidence of smut from 56·8 to 0·4, 0·4, 0·0, 0·0, and 4·2 per cent., respectively. Micronized free-flowing and wettable sulphur (each at 3 oz. per bush.) did not augment the stand, but effectively combatted the disease (0·9 and 1·3 per cent. infections, respectively).

These results are important as showing that several economical and efficient seed-grain disinfectants are available without drawing on the copper and mercury resources of the country, which must be conserved for military purposes.

WANG (C. S.). **Physiologic specialization and the control of Millet smut.**—*Phytopathology*, xxxiv, 12, pp. 1050–1055, 1944.

Millet (*Setaria italica*) smut (*Ustilago crameri*) is responsible for heavy losses, ranging from 10 to 50 per cent., in north and north-eastern China [*R.A.M.*, v, p. 656]. Although the disease is controllable by seed treatment, it is preferable and more economical to combat it by the use of resistant varieties, and to this end the question of physiologic specialization within the species was investigated, nine chlamydospore collections [ibid., xxiii, p. 174] from different parts of China being tested on 11 millet varieties at the Minnesota Agricultural Experiment Station in 1935 and on 12 in 1936. On this basis six physiologic races have been distinguished. Four collections were classified as race 1 because of their similarity in virulence on the five differential hosts, German No. 10, Kaifeng No. 232, Nanking No. 31, Unnamed Selection No. 12, and Siberian No. 13020, while each of the other collections represented a different physiologic race. All the varieties tested were susceptible to certain races of *U. crameri*; German No. 10 was the most resistant and Hungarian No. 232, Siberian No. 1120, and German No. 18 among the most susceptible. The relative prevalence of the different races must be taken into consideration in breeding *S. italica* for smut resistance.

Pending the development of resistant varieties, a temporary palliative must be be sought in seed disinfection. Of the 11 preparations tested for this purpose, new improved ceresan (½ oz. per bush.) was the most effective, reducing the incidence of infection from 26·9 and 42·9 to 0·8 and 0·4 per cent. in 1935 and 1936, respectively. Fairly good results were also achieved with a formaldehyde dip (1 in 250), 2 oz. cuprocide, 4 oz. 20 per cent. copper carbonate, and 2 oz. barbak III, the amounts of smut in these plots being 1 and 1·1, 3·6 and 1, 3·1 and 3·1, and (in 1936 only) 4·6, respectively. In general, sulphur fungicides proved ineffective.

FAWCETT (H. S.). **A starch test for quick decline.**—*Calif. Citrogr.*, xxx, 4, p. 122, 1 fig., 1945.

In October, 1944, it was ascertained that Valencia and navel orange trees on sour orange rootstocks in the San Gabriel Valley, California, when recently visibly affected by 'quick decline' [characterized by sudden foliage wilting and eventual breakdown or death: *Calif. Citrogr.*, xxix, p. 245, 1944] showed no starch in the wood or bark of line roots at their outer extremities, and, in most cases, in the wood of larger line roots well in towards the trunk. Further tests showed that some orange trees on sour orange roots had outer line roots devoid of starch, generally

with some dead fibre roots, even before any sign of the disease could be detected in the tops. Later work showed this lack of starch almost invariably in recently affected trees, but not always in those which had shown decline for some months or a year or two, and in which deterioration appeared to have reached a kind of equilibrium.

A simple test for the presence of the condition was devised, in which potassium iodide solution (1·5 gm. potassium iodide, 0·3 gm. iodine, and 100 c.c. water) or standard-strength tincture of iodine added to water at the rate of 5 parts per 100, is dropped on to the cut surface of roots not more than $\frac{1}{4}$ in. in diameter dug up from the outer margin of the suspected tree, and in which a fresh cut has been made with pruning shears. If the tree is in an early stage of quick decline no dark blue or black colour will appear, or if it does, it will be central, or distinctly on one side of the wood. The test is not reliable if the deterioration has become arrested or the tree is putting out new growth.

HARVEY (J. V.). **Fungi associated with decline of Avocado and Citrus in California (II).**—*Plant Dis. Reptr*, xxviii, 34, pp. 1028–1031, 1944. [Mimeographed.]

Continuing his investigations on decline of avocado and citrus trees in California [*R.A.M.*, xxiii, p. 482], the author states that of 307 declining avocado trees examined, 164 yielded *Phytophthora cinnamomi*, while of 268 non-declining avocado trees, 46 yielded the fungus, mostly from trees in distressed groves. *Pythium vexans* was consistently present in diseased avocado roots.

In southern Californian soils, *Pythium ultimum* was found 49 times in 94 samples (52·1 per cent.), *P. debaryanum* 13 times (13·8 per cent.), and *P. anandrum* 6 times (6·4 per cent.). In 124 declining citrus trees, *P. ultimum* was found 57 times, and in 93 non-declining citrus trees 13 times. *Phytophthora citrophthora* was found 8 times in 124 declining citrus trees, and not at all in 93 non-declining citrus trees.

The evidence showed that excess water and poor drainage in most cases tended to initiate decline. In avocado, especially, decline appears to spread from focal points, the typical focal point being usually a swale or a point where water has been allowed to saturate the soil and remain over a long period.

NADEL (MINA). **Anatomical study of the button of Shamouti Oranges in relation to stem-end rot.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 166–170, 1 fig., 1944.

The stem-end rot of Shamouti oranges, so prevalent in Palestine, is chiefly caused by *Diplodia natalensis* [*R.A.M.*, xx, p. 13] and to a minor degree by *Alternaria* sp. and *Colletotrichum gloeosporioides*. The rot is not apparent when the fruit is picked and begins to develop at the button end. Buttons were fixed with alcohol-formalin-acetic solution, sectioned and stained with cotton blue or Pianese solution. Mycelium was found superficially on the button, chiefly in the axils of the sepals and sometimes on the exterior of the lesions, but never internally. It was invariably separated from the fruit tissue by a layer of cork, but no hyphae were detected in the cork layer itself. After the petals and stamens had fallen, a cork layer formed some distance below and the tissue above became necrotic. It usually contained mycelium and on occasion spores, even when the fruit was only about 3 cm. in length. Hyphae have never been detected below the cork layer on fruit still attached to the tree.

In September, young fruits attached to the tree were wounded with a sterile needle, and some were also inoculated with a suspension of *D. natalensis* spores, brushed on to the surfaces of the fruits. Protective cork layers were formed around uninoculated pin pricks and between the mycelium and the fruit. Mycelium was never found inside the fruit in cases where the mycelium present in the buttons was shown by culture to belong to *D. natalensis*, *Alternaria*, or *C. gloeosporioides*. After picking, the mycelium of fungi present in the outer tissues of the button appears to penetrate the fruits in a manner not adequately understood and to cause storage rots.

MINZ (G.) & BEN-MEIR (YOHEBED). **Pathogenicity of Diplodia from various hosts to Citrus fruits.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 162–165, 1944.

Stem-rot of Shamouti orange fruits may be induced by inoculation with spores of *Diplodia natalensis* [see preceding abstract], not only from twigs of all the other citrus species tested, namely, lemon, grapefruit, Valencia and bitter oranges, and mandarin, but also from the following hosts of the fungus in Palestine: *Acacia farnesiana*, groundnut, *Cereus straussii*, quince, loquat, *Euphorbia grandidens*, *Ficus elastica*, *F. nitida*, walnut, apples, mango, white and red mulberry, plum, *Ricinus communis*, rose, and vine. The isolates from Shamouti orange also infected lemon, grapefruit, and mandarin, while those from lemon and grapefruit were reciprocally pathogenic. The only sources of inoculum giving negative results in the cross-inoculation tests were date palm, *Mentha piperita*, and *Pyrus syriaca*. Hence there is a risk that *D. natalensis* from almost any of its hosts may attack the most important citrus fruits cultivated in the country.

WADE (G. C.). **Production of copper deficiency symptoms of Citrus in solution culture.**—*J. Aust. Inst. agric. Sci.*, x, 4, pp. 176–177, 1944.

In an experiment carried out in Victoria to ascertain whether citrus seedlings would develop copper deficiency symptoms when grown in solution culture, Valencia orange seedlings were grown in Arnon's solution (*Amer. J. Bot.*, xxvi, pp. 144–149, 1938), the main constituents of which were purified by Stout and Arnon's modification of Steinberg's method (ibid., xxviii, pp. 322–328, 1938). All the heavy metals, save iron, known to be important for plant growth, were added to one series, and the same heavy metals, except copper and iron, to the other. Iron was added to all culture solutions at weekly intervals, as 0·5 per cent. ferrous sulphate plus 0·4 per cent. tartaric acid solution, 0·6 ml. being used per l.

The plants were grown in pyrex beakers blackened on the outside, with plaster of Paris tops coated with paraffin, and were aerated continuously with air filtered through caustic soda solution, dilute hydrochloric acid, double distilled water, and cotton wool. The solutions were changed every six to eight weeks.

The results showed that the copper-deficient plants grew much less rapidly than those in the complete solution, and had shorter internodes. After eight weeks, their terminal shoot developed into a multiple bud of the exanthema type, consisting of a cluster of 10 to 20 buds. After this, they made little further growth. Concurrently with the development of multiple buds, the youngest leaves showed an irregular, pale green mottling. The root growth was greatly reduced.

BLISS (D. E.). **The response of Khadrawy Date Palms in Omphalia-infested soil.**—*Rep. Date Grs Inst., 1944*, pp. 13–16, 2 graphs, [? 1944].

Omphalia pigmentata and *O. tralucida* attack the Deglet Noor date variety so severely in California that it has sometimes been necessary to abandon the area to other crops. Observations indicated that other desirable species are less susceptible, and in May, 1933, an experiment was initiated on the resistance of Khadrawy in *Omphalia*-infested soil. Equal numbers of similar nursery-rooted offshoots of Deglet Noor and Khadrawy, of healthy appearance, were interplanted between rows of diseased Deglet Noor palms in a garden near Thermal designated T, and a similar lot of each of the offshoots was planted in the same garden but half a mile from the nearest known area of infection. Equal numbers of each species were also planted in another garden, near Indio, California, an area in which the disease had never been known. Samples of roots were taken from various palms at different times to test for and observe the progress of the disease. The results show that the infested area affects Khadrawy far less than it does Deglet Noor. For example,

in non-infested soil, the average growth of Deglet Noor palms was twice as great as that of Khadrawy palms, but in the infested soil the Khadrawy was twice that of Deglet Noor. The Deglet Noor variety showed the secondary symptoms of *Omphalia* root rot, such as small, weak leaves and fruit bunches, a yellowish colour, and a decline in vigour. The stunted Khadrawy palms were fairly green but lacked vigour.

In 1943 the Khadrawy palms bore 8 to 8·8 fruit bunches on non-infested soil and 6·3 fruit bunches in the infested soil. Deglet Noor bore an average of 10·9 to 12·1 in the control areas but only two in the root rot area. In 1940 a few Khadrawy palms in non-infested soil in both gardens were found to be infested with *Omphalia*. Assuming, as is probable, that the offshoots had been infected when first planted, this implies that the Khadrawy variety is a potential carrier of the disease in a masked form and a long-standing source of danger to other species. Further knowledge of disease resistance among commercial date varieties is of importance in the control of *Omphalia* root rot.

FRAZER (HELEN L.). **Observations on the method of transmission of internal boll disease of Cotton by the Cotton stainer-bug.**—*Ann. appl. Biol.*, xxxi, 4, pp. 271 290, 1 pl., 5 figs., 2 graphs, 1944 [1945].

A study of the transmission by *Dysdercus* spp. of internal boll disease of cotton caused by *Nematospora gossypii* and allied fungi [*R.A.M.*, xxi, p. 415; xxiii, p. 431] demonstrated a close association of the insect with diseased plants in nature, visitation of healthy plants by the insect under conditions suitable for transmission of the disease, the presence of the pathogen in or on the insect in nature, or following visitation of a diseased plant, and experimental production of the disease by insect visitation under controlled conditions. It is therefore claimed that *Dysdercus* spp. are proved vectors of the disease.

Spores and mycelium of the fungus were found present as an external contaminant on the mouth parts and internally in the deep stylet pouches, where spore germination is possible. The fungus is cast off with the exuviae during moulting, but recontamination occurs.

That spores sucked up with food should reach the alimentary canal via the normal food channels is readily understandable, but as regards their presence in the stylet pouches, three explanations are possible. These may be leakage during feeding, a view supported by direct observation of the insect anatomy. The spores might also enter via openings between the chitinous plates of the head; this, however, was disproved experimentally. Thirdly, the spores might pass through the living tissue from the intestine and re-emerge; but no evidence could be obtained to support this view. Observations indicated that the spores do not remain viable in the intestine. The insects become infective immediately after feeding.

As for the manner in which the fungus leaves the insect, the author's view is that it enters and leaves by the same route. The evidence did not show that the salivary glands become contaminated, and, further, to reach them the fungus would have to invade living tissues, there would be a time lag before the insect could cause infection, and infections would then occur with some regularity. This was not the case. Regurgitation appears to be improbable in view of the valve at the entrance to the midgut and the absence of any evidence that spores remain viable in the intestine. The observation by various workers that the disease develops only when the fungus is introduced through the wall of the cotton boll indicates that the inoculum must be conveyed via the proboscis, and rules out the possibility of passive infection from excreta. Attempts to observe the form in which the fungus leaves the insect were not successful. The observations showed that infections occur entirely at random, and support the view that ejection of the

fungus is by chance. Transmission is purely mechanical, with the insect obligatory solely in its function as a syringe to inject the fungus, which otherwise is unable to reach its substrate. Insect and fungus can develop independently and the insect appears to remain unharmed by the presence of the organism. No alternative morphological form of *N. gossypii* was found within the insect.

The results obtained do not affect the control methods already practised, i.e., insect-trapping, destruction of alternative hosts, and selection of planting time to avoid insect attack.

FULLER (W. H.) & NORMAN (A. G.). **The nature of the flora on field-retting Hemp.**—Abs. in *J. Amer. Soc. Agron.*, xxxvi, 12, pp. 1014–1015, 1944.

The field-retting of hemp involves the freeing of the fibre bundles from the surrounding softer tissue by the enzymatic action of micro-organisms. The microscopic examination at the Iowa Agricultural Experiment Station of strips of bark revealed a profusion of fungal mycelium growing over and through the surface, species of *Alternaria*, *Hormodendrum*, *Fusarium*, *Cephalosporium*, and *Phoma* being the most prevalent on all samples. *Fusarium* developed most frequently on green hemp just beginning to ret and on that in the bottom of the swath, being generally replaced by *Phoma* in the later stages of the process.

MUSKETT (A. E.) & COLHOUN (J.). **The prevention of seed-borne diseases of Flax by seed disinfection. II. Comparison of the dusting, short wet and fixation methods of treatment.**—*Ann. appl. Biol.*, xxxi, 4, pp. 295–300, 1944 [1945].

Continuing their investigations [*R.A.M.*, xxii, p. 358], the authors in 1942 sowed Liral brown flax seed showing 18·8 per cent. infection by *Polyspora lini* and 6·4 per cent. by *Colletotrichum lini* [*C. linicola*] after treatment with organo-mercury preparations. The rates of application per 500 gm. seed were: nomersan 3·35 gm., ceresan (1875 A) 3·35 gm. fixed with water 30 or 40 ml., ceresan experimental 3·35 gm. fixed with water 30 or 40 ml., ceresan (U. 564) 6 per cent., 40 ml., ceresan (U. 564) 8 per cent., 30 ml., ceresan (U. 564) 8 per cent., 40 ml., ceresan (U.564/2/B1) 6 per cent., 40 ml., ceresan (U. 564/2/B1) 8 per cent., 30 ml., and ceresan (U. 546/2/B1) 8 per cent., 40 ml. The crop yields in lb. per plot of 24 sq. yd., the seed being sown at the rate of 80 lb. per acre, were, respectively, 17·69, 22·41, 26·13, 25·72, 26·63, 27·78, 26·31, 27·88, 29·41, 25·25, 27·03, and 26·07, and the fibre yields 0·9, 1·61, 1·71, 1·76, 1·73, 1·92, 2·1, 2·03, 2·34, 1·99, 2·22, and 1·87.

These and other results [which are tabulated] confirm the previous findings that the disinfection of flax seed materially helps to cleanse it from contamination with *P. lini* and *C. linicola*. Against *P. lini*, nomersan is only partially effective. Short wet or fixation treatment with organo-mercurial preparations gave much better control of *P. lini*, though they did not entirely eliminate it. All the treatments gave substantial control of *C. linicola*, ceresan U. 564/2/B1 being as effective as nomersan, which was highly satisfactory. In the case of stem-break and browning (*P. lini*), all the treatments significantly increased crop and fibre yields. As in 1940 and 1941, treatment of seed heavily infected with *C. linicola* did not significantly affect crop yield. Against *C. linicola* most of the treatments employed do not affect fibre yield to a greater extent than nomersan at 12 oz. per cwt. With seed only very slightly infected with either fungus, fibre yield was significantly increased by nomersan 12 oz. and ceresan U. 564, 8 per cent. at 0·9 or 0·67 gal. per cwt. The last-named treatment did not significantly affect crop yield. This result indicates that benefit may result from disinfecting seed not heavily infected with either parasite, and that such disinfection may carry with it a benefit other than that attributable to control of parasites. It would appear that no treatment consistently influences crop establishment under field conditions.

DIMOCK (A. W.) & ALLYN (H.). **Dipping rooted Chrysanthemum cuttings in fermate for Septoria leafspot control.**—*Bull. Chrysanth. Soc. Amer.*, xii, 2, pp. 8–11, 1944. [Mimeographed.]

In further trials in the New York district for the control of chrysanthemum leaf spot (*Septoria*) [*obesa* and *S. chrysanthemella*: *R.A.M.*, xxii, p. 312] on the highly susceptible Yellow Fellow variety, dipping in fermate (1½ lb. per 100 gals.) plus DuPont spreader-sticker (3 fl. oz. per 100 gals.) gave such excellent results as to justify the use of this treatment for all the cuttings intended for field planting in 1943, when almost complete control was obtained under conditions highly conducive to infection. Late in the season the disease appeared in unprotected growth in cut-over beds, suggesting the survival of the pathogens either independently in the soil or on infected refuse from the previous season.

JENKINS (ANNA E.). **'Oedema' or wart of cultivated Violet identified as scab.**—*J. Wash. Acad. Sci.*, xxxiv, 11, pp. 352–357, 1 fig., 1944.

This is an expanded account of the writer's studies on the 'oedema' or 'wart' of cultivated violets in the United States, leading to its identification with the disease now known as scab (*Sphaceloma violae*), a preliminary note on which has already appeared [*R.A.M.*, xxiv, p. 150].

STAPEL (C.) & BOVIEN (P.). **Markfrøafgrødernes sygdomme og skadedyr.** [The diseases and pests of pasture crops.]—232 pp., 47 col. pl., Copenhagen, Det Kgl. Danske Landhusholdningsselskab [The Royal Danish Agricultural Society], 1943. [Received March, 1945.]

In this book, a companion to a similar treatise on potato diseases published in 1940 and to one by E. Gram and P. Bovien dealing with the diseases and pests of root crops (1942) [*R.A.M.*, xxii, p. 284], the authors present much useful information, supplemented by attractive coloured plates, concerning the parasitic and non-parasitic disorders of legumes (including clovers, lucerne, peas, field beans, and lupins), grasses, carrots and other Umbelliferae, sugar and fodder beets, and crucifers in Denmark.

JONES (F. R.). **Winter injury and persistence in Alfalfa.**—Abs. in *J. Amer. Soc. Agron.*, xxxvi, 12, p. 1,000, 1944.

In 1940, over 500 clones from unselected plants of four lucerne varieties [*R.A.M.*, xxii, pp. 420, 435] more or less resistant to wilt [*Corynebacterium insidiosum*] were set in cultivated rows at the Wisconsin Agricultural Experimental Station to determine their longevity under favourable conditions in the local environment. The four succeeding winters were not exceptionally severe, but after the fourth 12 to 20 per cent. of the clones were dead, and about twice as many in a poor state of health, presumably as a result of progressive deterioration following winter injury. The characteristic individual responses of these and other clones to winter injury have been found to become more apparent as the plants mature, those observed during the particular five-year period under discussion, for instance, showing great differences in their capacity to survive and flourish, with marked superiority in a small percentage. It would seem, therefore, that selections based on the actual performance of clones in a given region should give rise to a strain with enhanced resistance to the ordinary hazards of the local climate.

CHORIN (MATILDA). **Leaf and stem spot of Egyptian Clover.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 175–178, 1 fig., 1944.

In recent years, Egyptian clover (*Trifolium alexandrinum*) has been increasingly affected in Palestine, where it is one of the chief forage crops, by a leaf and stem

spot which leads to a drying-up of the whole plant. The spots first appear on the lower leaf surface as small, round, dark brown lesions, usually surrounded by a yellow halo. As they enlarge, they are also seen on the upper leaf surface; the centres are light brown and dry and sometimes show concentric zones, while the edge remains dark brown, and there is no halo. The spots first appear at the tip, along the veins, and in the centre of the leaf. Individual spots may coalesce and cause the leaf to dry up. On the stems, the spots are more elongated and may unite to cover the whole stem. Sometimes they penetrate some distance into the stem, splitting the outer tissues, and producing a canker-like lesion.

The black, more or less globose pycnidia, measured 90 to 150 μ in diameter, while the two-celled, hyaline spores, rounded at the ends and generally slightly constricted at the septum, measured 15 to 20 by 3 to 5 μ. In 150 samples from 22 localities throughout Palestine, the spores were never found to contain more than one septum; the young spores sometimes showed only one cell. The fungus is provisionally identified as *Ascochyta trifolii* [*R.A.M.*, xvii, p. 440]. Perithecia of *Sphaerulina* sp. were frequently found in association with the pycnidia of *A. trifolii*.

DILLON WESTON (W. A. R.) & TAYLOR (E.). **Some observations on powdery mildews.**—*Trans. Brit. mycol. Soc.*, xxvii, 3–4, pp. 119–120, 4 figs., 1945.

Overwintering in the form of dormant mycelium has been shown to be the primary means of hibernation of apple mildew (*Podosphaera leucotricha*). Oak mildew (*Microsphaera alni* var. *extensa*) perennates in this way as, it is stated, does *Sphaerotheca pannosa* on peach. In a Cambridge garden it has been observed that when hawthorn hedges have been neglected and left untrimmed, *P. oxycanthae* appears early in the season on young leaf and flower shoots and that these are evenly mildewed all over. When the hedges are cut in the autumn, mildew is negligible in the following year. The bush roses in the garden are carefully pruned and suffer but slightly, while the rambler roses, which receive less attention, are severely attacked by *S. pannosa*, especially where they grow under the shade of trees. Although heavily over-shaded, gooseberries pruned annually and not sprayed were nearly free from American gooseberry mildew [*S. mors-uvae*] for twelve years, but in 1943 pruning was not carried out and in 1944 mildew appeared in a virulent form on the berries. It is suggested that a thorough study should be made as to whether or not these mildews perennate wholly or partly by dormant mycelium in the bud.

SHAY (J. R.) & KEITT (G. W.). **The inheritance of certain mutant characters in Venturia inaequalis.**—*J. agric. Res.*, lxx, 2, pp. 31–41, 3 figs., 1944.

This is an expanded account of studies on the genetics of the apple-scab fungus, *Venturia inaequalis*, a preliminary account of which has already been noticed from another source [*R.A.M.*, xxiii, p. 254]. The mechanism of inheritance in *V. inaequalis* appears to be essentially the same as that in *Neurospora crassa*, but minor changes of position of nuclei or spores are not infrequently encountered. All the characters studied were inherited independently except 'tan' and 'white', which were linked. The four mutant genes (white, tan, non-conidial, and small) and the sex-reaction factors have been located with respect to their centromeres.

The effects of a single mutation on the behaviour of the fungus may be profound. The white (W) mutant prevents the development of the characteristic dark pigment in the thallus, induces abortion of ascospores, and probably by interacting with modifying factors suppressed the expression of pathogenicity in the parent line. The mutant labelled 'small' is shown to suppress macroscopic expression of pathogenicity, though penetration of the host is accomplished and a microscopic subcuticular development occurs.

The demonstration that gene mutations are capable of complete or partial

suppression of pathogenicity emphasizes the importance of the elimination of modifying factors in the parental material before a genetical analysis of pathogenicity is attempted.

PERLBERGER (J.). **The occurrence of Apple and Pear scab in Palestine in relation to weather conditions.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 157–161, 2 graphs, 1944.

Apple and pear scab (*Fusicladium dendriticum* and *F. pirinum*) [*Venturia inaequalis* and *V. pirina*] occur throughout Palestine, local varieties only, however, being affected. The European varieties of these fruits introduced into the country of recent years commence their seasonal growth four to six weeks later in the case of apples, and two to three in that of pears, than the local sorts, by which time the rains have usually ceased, the temperature is higher, and atmospheric humidity low. Under such conditions the spore-germination requirements of *V. inaequalis* [*R.A.M.*, vi, p. 299; xi, p. 50, et passim] are not fulfilled, and hence the freedom from infection of the foreign varieties is attributable rather to their escape from adverse meteorological factors than to any change in their inherent predisposition to scab.

COOLEY (J. S.). **Some host-parasite relations in the black root rot of Apple trees.**—*J. agric. Res.*, lxix, 12, pp. 449–458, 3 graphs, 1944.

When young apple trees in nursery rows were inoculated at monthly intervals from 1933 to 1935, inclusive, with *Xylaria mali* [*R.A.M.*, xxii, p. 69], in each year the percentages of infection rose in June, reached a peak in July (83 and 88 per cent. in 1934 and 1935, respectively), and declined to less than 10 per cent. in September. It was also found that susceptibility at any particular date may vary from season to season; thus, in August, 1934, infection was 57 per cent., whereas in August, 1935, it was only 9 per cent. If the soil temperatures followed the air temperatures during the period of the experiment, they should have been sufficiently high for infection in August and September, when the attacks were, in fact, moderately light. Earlier work [loc. cit.] having shown that *X. mali* infects apple trees much more readily when the host is in a low state of vigour than at other times, it would appear that susceptibility may be associated with a seasonal diminution in root activity rather than with some temperature change.

Experimental maltreatments of the trees at monthly intervals, including cutting the trunk more than half-way through and bending the top over, ringing the trunk, root-pruning, and summer-pruning of the branches, were carried out from April to August, roots being inoculated in July on trees treated up to that time and on untreated trees, and in August on trees maltreated in that month. The general trend of the results of maltreatment was a slight increase in the percentage of infected trees and in the size of the lesions, as compared with trees not maltreated. The greatest effect occurred when the treatments were applied in June and the inoculations effected in July. The evidence indicated that susceptibility to infection and the extent of the lesions are probably influenced by the seasonal activity of the trees.

In 1937, three-year-old Stayman Winesap trees worked on seedling roots were experimentally defoliated twice a month from 3rd May until 18th October, inoculations being made on 15th July and subsequently with each defoliation. Non-defoliated controls were similarly inoculated on the same dates. In 1938, the treatments were repeated, the inoculations being made on the opposite side of the trees; in 1939, no defoliations were carried out, but all the trees were inoculated in mid-July. The results obtained showed that, in general, defoliation slightly increased susceptibility to infection. Defoliation early in summer resulted in greater susceptibility and greater stunting of growth than defoliation effected in the latter part of the summer.

DUNEGAN (J. C.), ROBERTS (J. W.), & GOLDSWORTHY (M. C.). **Spray experiments with organic fungicides for the control of Apple bitter rot.**—*Plant Dis. Reptr.*, xxviii, 34, pp. 1035–1037, 1944. [Mimeographed.]

During 1944, Ada Red apple trees growing in an orchard at Centerton, Arkansas, where the crop had been destroyed by bitter rot (*Glomerella cingulata*) [*R.A.M.*, xxii, p. 487] in 1942 and 1943, were treated with Bordeaux mixture (4–6–100), four applications, fermate 1½ lb. per 100 gals., eight applications, U.S. Rubber 604 (2, 3-dichloro-1, 4-naphthoquinone) 1 lb. per 100 gals., eight applications, and disodium ethylene bisdithiocarbamate (dithane, HE-175), zinc sulphate, hydrated lime, 1–1–½ lb. per 100 gals., eight applications. The total numbers of apples examined after the four treatments were, respectively, 15,098, 22,086, 23,415, and 16,798, together with 12,756 untreated controls, and the percentages of bitter rot were, respectively, 52·6, 29·3, 12·1, 72·6, and 89·8.

The reduction of infection to 12·1 per cent. in an orchard where the fungus had caused loss of the commercial crop in the two preceding seasons and destroyed nine-tenths of the crop on the control trees in the year of the test shows a very high degree of effectiveness against the bitter-rot fungus on the part of U.S. Rubber 604. Other workers have found this compound highly toxic to *G. gossypii*. The material caused, however, a definite superficial spotting of the fruit.

MCCOLLOCH (L. P.). **A study of the Apple rot fungus Phialophora malorum.**—*Mycologia*, xxxvi, 6, pp. 576–590, 4 figs., 1944.

Further studies on *Phialophora malorum* [*R.A.M.*, xxii, p. 211], which causes serious loss in stored apples, showed that the fungus grew best on Thaxter's agar of unoxidized potato juice and 2 per cent. dextrose. The colour varied greatly according to the medium, and strain differences in the production of dark pigment were marked on Czapek's agar. Growth in culture appeared to be best between P_H 4·4 and 6. All strains produced oxidase though not at the same rate or intensity. Saltation occurred in respect of colour, texture, rate of growth, and physiological behaviour, and in one strain were considerable; the variations found justified the inclusion of all the isolates studied in the single species.

The conidia are extruded from single, terminal, sporogenous phialides which, typically, are short, one-celled, ampulliform, but often unsymmetrical, structures. They are swollen through the centre, taper at the base, and have a constricted neck and a flared cup at the apex, through which the conidia are formed. The first indication of sporulation is the constriction and elongation of the phialide apex. The first conidium ruptures the terminal wall, and is cut off and extruded. The ruptured end of the phialide is kept in the shape of a cup by the formation of succeeding conidia, eventually becoming rigid. Normally, the conidia are never borne within the phialide, but are formed through a pore at the base of the cup. The protoplasm from the mother cell within the phialide, surrounded by a membrane, grows out through the pore, and the developing conidium, seated in the open cup, grows to maturity. The spore wall then forms, and the spore separates from the mother-cell connexion, being pushed out of the cup by the development of the next conidium. The conidia are extruded continuously in a mucus-like substance until the cell contents of the phialide are exhausted. Conidia produced on the aerial hyphae are held in packets at the tip of the phialides by the mucus. When sporulation is copious, the masses appear as glistening globules.

Excluded from *Sporotrichum* by the dark colour in the hyphae, the poor to moderate hyphal branching, and the mode of conidial formation, the fungus has been designated *Phialophora malorum* (Kidd & Beaum.) McColloch [loc. cit.], syn. *Sporotrichum malorum* and *S. carpogenum*. The amended description states that it shows hyaline, later fuscous to brown, septate, moderately branched hyphae

1 to 4 μ in diameter, terminal and intercalary chlamydospores, typically vase-shaped conidiophores composed of specialized sporogenous cells, measuring 5 to 10·8 μ long and arising laterally, terminally, or in clusters from the hyphae, and hyaline to fuscous, subglobose to elliptical, unicellular conidia measuring 4·2 to 7·8 by 1·4 to 3·6 μ.

BOYNTON (D.) & BURRELL (A. B.). **Potassium-induced magnesium deficiency in the McIntosh Apple tree.**—*Soil Sci.*, lviii, 6, pp. 441–454, 1944.

Magnesium deficiency leaf blotch was induced in McIntosh apple trees growing on an acid soil low in exchangeable bases in the Champlain Valley, New York, by the application of muriate or sulphate of potash fertilizers over a period of three years or more [*R.A.M.*, xxiii, p. 443]. The appearance of the symptoms was accompanied by a decrease in the magnesium content of the leaves and an increase in that of potassium, and orchard and greenhouse studies pointed to the competitive effect of the latter element at the root surface or within the tree as the primary cause of the necrosis. The potash treatment further resulted in an increase of exchangeable potassium and a corresponding decrease of exchangeable magnesium in the surface soil below the trees. Twelve years of spraying, mostly with wettable sulphurs, combined with annual applications of ammonium sulphate, brought about a marked acidification of the soil, expressed by a drop in P_H from 5·7 to 4·3 under some of the trees suffering from magnesium deficiency leaf blotch.

KIENHOLZ (J. R.). **Mycosphaerella tulasnei in Apple and Pear orchards.**—*Mycologia*, xxxvi, 6, pp. 648–649, 1944.

After pointing out that the relationship between *Cladosporium herbarum* and *Mycosphaerella tulasnei* was confirmed by Ruehle [*R.A.M.*, xi, p. 310], the author states that perithecia have commonly been observed in the spring on overwintered apple and pear leaves at Hood River, Oregon, since 1932. Less often, partly developed perithecia were found developing in scurfy areas below buds on pear shoots which had grown rapidly during the past season. Typical *C. herbarum* cultures were obtained from ascospore isolations of this material, and perithecia were again produced from cultures on sterilized wheat, apple, and pear leaves in culture.

Measurements of fresh, naturally occurring fruiting bodies from overwintered apple and pear leaves gave perithecia 100 to 160 μ wide by 150 to 250 μ deep, immersed in the leaf tissue from $\frac{1}{4}$ to $\frac{1}{3}$ of their depth, present on either leaf surface not in contact with the soil; asci, 32 to 107 by 11 to 27 (mean 67·2 by 17·4) μ; and ascospores, typically 2-celled, 11 to 29 by 4 to 9 μ, mean 21·6 by 7·9 μ (top cell) to 6·4 μ (bottom cell), hyaline to pale olivaceous-brown when older. The mean measurements for 3- and 4-celled ascospores were, respectively, 25·5 by 8 and 28·3 by 8·5 μ. The ascospores generally became 3- to 4-celled when germinating. Conidia produced in culture or on fruit tissue were variable in shape, almost globose to narrowly ellipsoid, 1- to 3-celled, up to 30 μ long, and with a finely echinulate spore wall.

WILLISON (R. S.). **Strains of Prune dwarf.**—*Phytopathology*, xxxiv, 12, pp. 1037–1049, 2 figs., 1 diag., 1944.

Symptomatological evidence is presented in support of the author's opinion that four viruses under investigation in Ontario, two on plum and two on cherry, are strains of the prune [plum] dwarf virus [*R.A.M.*, xxiii, p. 492], differing in virulence. Strain 1 was obtained from Italian prune grafted on Damson; 2 from an unknown blue prune variety showing marked dwarf symptoms after top-working on Damson; 3 (the agent of Elkhorn cherry ring spot [ibid., xxii, p. 142]) from a tree of this variety bearing on the leaves small, circular lesions, often with necrotic centres, and larger rings and blotches, and on the fruits minute, sunken

areas and internal brown spots; and 4, responsible for Eagle cherry mottle [loc. cit.] from an unfruitful Black Eagle tree with an inconspicuous foliar mottle.

All four strains were transmitted, by double-budding of the current year's growth and two-year nursery stock and by direct inoculation of the latter, to the Italian and German prune varieties, Lombard and Reine Claude, Montmorency and Napoleon cherries, Niagara apricot, and *Prunus mahaleb*. Grand Duke plums reacted to strains 1 and 2 (the only ones used on this variety) by leaf markings (transient in the former case), while in Abundance (*P. salicina*) the effects of strain 2 were mild and those of the others doubtful. On Black Tartarian cherry strain 3 was symptomless and the foliar markings of strain 1 faint or absent. The response of Black Eagle Cherry was indefinite in regard to strains 1, 3, and 4, and the symptoms induced by 2 were slight. The supposedly healthy Elkhorn cherry, which was scarcely affected by strains 1 to 3 (4 was not used), was found to be already harbouring the prune dwarf virus. In myrobalan [*P. divaricata*] strain 2 was the only one to induce noticeable symptoms in the shape of chlorotic mottling, lines, rings, and sometimes dwarfing. On Italian prunes and Lombard plums all strains induced typical strap-shaped, rugose, thickened foliage and their growth was stunted; peaches were also stunted and bore leaf markings of various types; while on cherries and *P. mahaleb* the foliar patterns assumed the forms of rings, lines, and oak leaves.

A tendency to recovery after the appearance of the initial 'shock' symptoms was observed in peaches and cherries.

HILDEBRAND (E. M.) & WEBER (P. V.). **Varietal susceptibility of Currants to the cane blight organism, and to Currant mosaic virus.**—*Plant Dis. Reptr*, xxviii, 34, pp. 1031–1035, 1944. [Mimeographed.]

Preliminary inoculation studies carried out in 1941 with the currant cane-blight fungus (*Botryosphaeria ribis*) demonstrated wide variation in the virulence of different strains. In 1942, one highly virulent culture was selected for studying the resistance or susceptibility of 55 different varieties of currants, and the results [which are tabulated] showed much variation in resistance and susceptibility. Thirty-eight of the varieties were found to be susceptible after the first test; the remaining 17 were then inoculated, whereupon only three became infected. When the 14 non-susceptible varieties were reinoculated a year later, they all remained unaffected. Breeding for resistance would appear to be quite possible.

Of the same 55 varieties, 35, or 63·6 per cent., were found to be susceptible to currant mosaic [*R.A.M.*, xviii, p. 536]. A peculiar crinkle of unknown origin was noted on four varieties, of which three were susceptible to mosaic and one not. The new commercial variety, Red Lake, did not appear to be susceptible to mosaic.

CALAVAN (E. C.). **The use of eradicant and blossom sprays on sour Cherry in the control of brown-rot blossom and spur blight incited by Sclerotinia laxa Ader. and Ruhl.**—Abs. in *Phytopathology*, xxxiv, 12, p. 997, 1944.

During the past two years, effective control of brown rot (*Sclerotinia laxa*) in the blossom- and spur-blight phases has been obtained in Door County, Wisconsin, by the application, shortly before bud-break, of a copper-lime-monocalcium arsenite and fish oil (3–2–2–1½ pints–50) eradicant spray, supplemented in early bloom by a protectant treatment of 3–4–50 Bordeaux mixture. During the wet spring of 1943 these sprays reduced the spurs blighted from 52·7 to 0·5 per cent. Either treatment alone was less satisfactory. Estimated reductions in percentages of total spurs blighted for trees receiving the dormant spray only, the blossoms spray only, and both applications were 97·5, 82·1, and 99·1, respectively. In 1944, the absence of infection periods until most petals had fallen resulted in only a small number (2·8 per cent.) of blighted spurs on the unblighted controls, and

under these conditions the dormant, blossom, and both sprays reduced the incidence of infection by 50, 60, and 92 per cent., respectively.

SCARSETH (G. D.). **Reported control of Panama disease.**—*Daily Gleaner*, Kingston, Jamaica, 25th January, 1945.

In this newspaper report of experiments made in Honduras by the Standard Fruit Company, La Ceiba, it is stated that the removal of banana mats infested by Panama disease (*Fusarium bulbigenum* [*oxysporum*] *cubense*) [*R.A.M.*, xiv, p. 378] resulted apparently after eight or nine years in a partial natural disinfection of the soil, the disease on such land being considerably retarded. A new series of trials was initiated in 1937 with this idea of biological disinfection as a basis. Strongly acid, light clay soil, cleared of living banana mats 12 years earlier, was given heavy applications of lime (12 to 15 tons per acre), worked into the top 5 to 8 in., to counteract the known adverse effects of undue acidity. Phosphate and potash were added and the ground planted with legumes, e.g., *Crotalaria* or velvet bean [*Stizolobium deeringianum*], several such crops being forked under in the course of a year or two before planting Gros Michel bananas. Some of these tests were more successful than others, and further large-scale operations, besides confirming the need for a lengthy period (10 to 12 years) of abandonment after the clearance of infested soil, emphasized the importance of turning under large quantities of organic matter. It has recently been ascertained, moreover, that the depth to which lime is incorporated with the soil is also an important factor. On a plot where calcium hydrate (preferable to calcium carbonate) was added to a depth of 2 ft. and the other above-mentioned requirements fulfilled, not a single case of Panama disease appeared in two years and five months, whereas a neighbouring untreated site showed 96 per cent. infection, which began to develop five months after planting. Clay soil should be selected for experimental trials of this method, and sufficient hydrate of lime should be added to obtain a P_H value of 7·5 to a depth of 16 to 24 in., requiring perhaps 12 to 15 tons per acre. Several leguminous crops should be ploughed in over a period of one or more years before replanting with banana.

NORRIS (D. O.). **The evaluation of D.D.T. as a fungicide.**—*J. Coun. sci. industr. Res. Aust.*, xxvii, 4, pp. 289–290, 1944.

Tests are reported of the possible fungicidal properties of D.D.T. (dichlorodiphenyltrichlorethane) on cultures of *Ophiobolus graminis*, *Colletotrichum trifolii*, *Pleospora herbarum*, *Ascochyta imperfecta*, and *Pseudoplea trifolii*, as a disinfectant for peas against damping-off, and for wheat against *Urocystis tritici*. The results showed that D.D.T. possesses no value whatever as a fungicide.

PALTI (J.) & MOELLER (S.). **Overhead application of fungicidal sprays (preliminary experiments).**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 184–192, 1944.

About one-half of the area under vegetables in Palestine is irrigated by overhead irrigation systems, and there are large areas of other crops in which the same method is employed. Much labour would be saved if the overhead pipes could be used for spraying. Besides, less damage would be done to the crops and the spraying could be done frequently and, if necessary, immediately after rain. On the other hand, a larger amount of material would be used and the under side of the leaf would be liable to remain unsprayed.

In comparative tests on small plots of potatoes for the control of *Alternaria* blight [*A. solani*] with 2 per cent. floridan the overhead treatment gave a yield of 1·08 times the untreated control, while the ordinary method gave 0·93 times. The corresponding figures for 1·5 per cent. cita California spray against powdery mildew of potatoes [*Oidium* sp.] were 1·17 and 1·11, for 1 per cent. floridan against

cucumber downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) 4·29 and 4·82, and for 1·25 per cent. floridan against the same disease 10·21 and 7·18, respectively. The rate of application of sprays by the overhead system was two or three times that of the ordinary system, but this drawback is considered to be outweighed by its many advantages.

BOOER (J. R.). **The behaviour of mercury compounds in soil.**—*Ann. appl. Biol.*, xxxi, 4, pp. 340–359, 5 figs., 4 graphs, 1944 [1945].

Studies conducted by means of a pot technique [which is described] demonstrated that when any mercury compound used in plant pathology is applied to the soil it decomposes into metallic mercury. Where the chloride ion is involved, the governing factor is the rate of decomposition of mercurous chloride. With other inorganic compounds of mercury direct reduction to the metal takes place. With the organo-mercury compounds, the rate of decomposition of the organo-mercury clay is probably the governing factor. The effects of mercury, while not permanent, may persist for a considerable time. Mercury is not a cumulative soil poison. It is not eliminated, but is rendered harmless by the formation of mercuric sulphide, probably as a result of bacterial action. The addition of sulphur to the soil appears to be the best way to purify it after it has been treated with mercury.

GARRETT (S. D.). **Root disease fungi. A treatise on the epidemiology of soil-borne disease in crop plants, and a first exposition of the principles of root disease control.**—vi+177 pp., 1 pl., 7 figs., 1 diag., Waltham, Mass., The Chronica Botanica Co.; London, William Dawson & Sons, Ltd., 1944. $4.50.

In this interesting book, much information on root-infecting fungi has been brought together in a convenient and stimulating form. The work 'is not intended to be a text-book and no attempt has been made to deal comprehensively either with all root-infecting fungi, or with the diseases they cause'; instead, attention is focused on 'a comparatively small number of fungi causing diseases of notable economic importance'. After an introductory chapter, six chapters are devoted to the parasitic and saprophytic activity of root-infecting fungi and the effects of soil factors. The second half of the book is given up to discussions on the control of root diseases in field crops (three chapters), plantation crops (three chapters), and glasshouse crops (one chapter), and concludes with a 16-page bibliography and indexes.

ARMITAGE (F. D.). **Chlorazol black as a stain for mycological specimens.**—*Trans. Brit. mycol. Soc.*, xxvii, 3–4, pp. 131–153, 5 figs., 1945.

Directions are given for the use of chlorazol black E as a stain for fungi. The dye can be added to lactophenol mixtures for use as temporary mounts. Sufficient dye is added to produce a dense, black solution and is allowed to stand two or three days before filtering for use. Permanent slides can be prepared by using a saturated stain in 70 per cent. ethyl alcohol or better still absolute methyl alcohol, the stain being allowed to act for at least three hours and the excess stain removed by washing in 70 per cent. alcohol before mounting in euparal. Dioxan-diethylene dioxide can be used as a dehydrating agent for specimens stained in alcoholic chlorazol black E.

HOOGERHEIDE (J. C.). **Antibiotic substances produced by soil bacteria.**—*Bot. Rev.*, x, 10, pp. 599–638, 1944.

After a brief introductive survey of the development of interest in antibiotic substances *inter alia* as therapeutic agents in soils, the author gives a detailed account, with numerous references to the relevant literature, of gramicidin [*R.A.M.*, xxi, p. 248] and tyrocidine, isolated from *Bacillus brevis* [loc. cit.], actinomycin A

and B, isolated from *Actinomyces antibioticus* [loc. cit.], streptothricin [loc. cit.], excreted by *A. lavendulae*, and other antibiotics. A bibliography of 145 titles is appended.

RABOLD (C. N.). **War lends impetus to proofing finishes.**—*Text. World*, xciv, 8, pp. 90–92, 4 figs., 1944.

Three types of finishes on cotton fabrics have been used in immense quantities by the military services since the outbreak of war, namely, flame-, mildew-, and water-proofing. Fungicides supplied to the army for the prevention of mildew damage [*R.A.M.*, xxiii, p. 71 *et passim*] include ortho-phenylphenol, 2-chlor-ortho-phenylphenol, salicylanilide, pentachlorophenol, 2, 2-dihydroxy-5, 5-dichlor-diphenylmethane, copper naphthenate [ibid., xxiii, p. 266; xxiv, p. 158], copper oleate, cuprammonium hydroxide, cuprammonium fluoride, zinc dimethyl dithiocarbamate, phenyl mercury acetate, phenyl mercury oleate, alkyl dimethyl benzyl ammonium salts, and amino-guaiacol benzothiazole imimo-urea. Various drawbacks attach to all these substances, some connected with difficulties of application by the solvent solution and single- or two-bath methods, and others with the toxicity of the chemicals to the finishers, their disagreeable odour, unattractive colouring, insufficient durability, and the like. At the present juncture some of these defects are of little importance, but they are likely to assume greater prominence under post-war conditions.

MEYER (J. R.). **Ação benéfica dos transplantes para o desenvolvimento de Orquédeas em meios nutritivos assimbioticos.** [The beneficial action of transplantations on the development of Orchids in asymbiotic nutrient media.]—*Biológico*, x, 11, pp. 374–376, 2 pl., 1944.

Excellent results were obtained by three or four annual transplantations of orchid seeds of the varieties *Cattleya schilleriana*, *C. citrina*, *Laelia purpurata*, *L. blackii*, *L. cinnabarina* and its var. *elegans*, and *Rodriguesia venusta* to fresh tubes of a modified Sladen's or the author's tomato juice medium [*R.A.M.*, xxiii, p. 403] at 18° to 22° C. The plants thus treated were larger, darker-coloured, and provided with better-developed roots than those left in the original tubes for comparable periods.

JACOB (F. H.). **A two years' survey of the Potato aphides in the Northern Agricultural Advisory Province.**—*Ann. appl. Biol.*, xxxi, 4, pp. 312–319, 1 map, 1944 [1945].

After pointing out that efforts to maintain virus-free stocks of potatoes depend largely on the successful isolation of the potatoes from insect vectors, and that such isolation depends on geographical, climatic, and biological factors, the author states that of these factors the biological ones are fundamental, since it is only by studying them that the significant geographical and climatic factors can be determined. Details are given of a survey made during 1942 and 1943 in the Northern Agricultural Advisory Province of the potato aphids, *Myzus persicae*, *M. pseudosolani*, and *Macrosiphum solanifolii* [*M. gei*], with special reference to overwintering and the weather conditions prevailing at the time of the spring migration. It is tentatively concluded that provided districts are selected that are well isolated from the sources of spring infestation, there would appear to be large areas well suited to the maintenance of healthy seed potatoes in Cumberland, Westmorland, and the more hilly western parts of Northumberland and Durham.

NATTRASS (R. M.). **A new bacterial disease of the Potato in Kenya.**—*E. Afr. agric. J.*, x, 3, pp. 162–163, 2 pl., 1945.

Brown rot caused by *Bacterium* [*Xanthomonas*] *solanacearum* is well known in

Kenya, but a new disease has appeared with symptoms apparently identical with ring rot (*Corynebacterium sepedonicum*), though attempts to demonstrate a Gram-positive organism have so far failed and the identity of the pathogen remains in doubt. From comparison with a culture of *C. sepedonicum* received from Dr. L. C. Knorr, however, the author concludes that the Kenya ring-rot organism cannot be identified with that species. The exudation of whitish, putty-like masses of bacteria from the cut tuber surface characteristic of *C. sepedonicum* was observed. In advanced stages the bacterial masses can be seen embedded in the tissue even though no external sign of disease may be apparent. Wilting and yellowing of the leaves, another symptom induced by *C. sepedonicum*, was present and wilting was induced by inoculation through needle pricks. The disease is not apparently carried over in the soil, but in Kenya where volunteer plants are so persistent it will not be easy to eradicate. Control measures recommended are the use of healthy seed and the disinfection of all material used in handling the crop.

SMALL (T.). **Dry rot of Potato (Fusarium caeruleum (Lib.) Sacc.). Investigation on the sources and time of infection.**—*Ann. appl. Biol.*, xxxi, 4, pp. 290–295, 1944 [1945].

In investigations carried out in Cheshire into potato dry rot (*Fusarium caeruleum*) [*R.A.M.*, xxiii, p. 242], inoculations of healthy tubers with soil samples from tubers taken from 12 Cheshire farms in the field at digging time before the potatoes came into contact with any other source of infection, such as hampers or sacks, from farmers' own seed stored in boxes in lofts two to three weeks after lifting in July, and before any dry rot appeared, from healthy seed in boxes during winter, and from sacks of seed from Scotland and Northern Ireland stored in warehouses, showed that almost every soil sample tested was contaminated. The fungus appeared to be widely distributed in Cheshire soils: in four cases, potatoes had not been grown in the soil for five or six years, and in one for nine years. The fungus was ascertained to be viable in soils with P_H values between 5·25 and 6·74.

In trials made on eight farms in 1942 and again in 1943, using the farmers' own saved seed, the tubers were lifted with a spinner in July and at digging time were placed in boxes, or were 'standard' bruised and placed in boxes. One-half of each series, bruised and unbruised, were dipped for one minute in a proprietary organo-mercury preparation. Dry rot appeared in September. In October, the affected tubers (few in the unbruised, undipped series, but numerous in the bruised, undipped) were discarded, and 40 tubers bearing spore pustules were placed in contact with the healthy tubers remaining in each box. In February, the increase in dry rot in the dipped, undipped, and control boxes was negligible. The costly and laborious procedure of regularly examining seed potatoes and rejecting affected ones would appear to be unnecessary in areas where the growers lift and store their own-grown seed in boxes.

In laboratory tests, one diseased tuber was cut, and the knife then used to cut eight mature seed consecutively; six tests were made, and the 96 half tubers stored in a damp chamber. The controls, cut with a sterile knife, remained healthy. Forty-two of the other halves developed dry rot, a sevenfold increase. In the six tests, the disease was spread up to the fourth to eighth tuber. Treatment of the half tubers with an organo-mercury preparation immediately after cutting did not adequately check the disease. Contaminated knives may cause serious loss when cutting is done several weeks before planting, but where cutting is delayed until planting the result depends on the rate of disease development and plant establishment.

Other work demonstrated that contaminated seed boxes may be a source of infection, especially if the tubers are bruised. The small losses sustained among washed, bruised tubers in new boxes suggested that little, if any, infection occurs

before lifting. In one test with about 500 freshly dug tubers, removal of the soil by washing reduced dry rot from 20·7 to 3·1 per cent., and in another from 10·4 to 0 per cent. Mature wounded and unwounded tubers became infected when placed in contact with contaminated soil, while infection also occurred when mature, inoculated tubers were buried in soils with a wide range of temperature, moisture, and P_H values.

In the author's opinion, where the field soil is contaminated this is the main source of infection. Little if any benefit is to be expected from cleaning hampers, boxes, lofts, and sacks, as these will soon become recontaminated.

PERSON (L. H.). **A Pythium tuber rot and wilt of Irish Potatoes.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1010, 1944.

During a spell of cool weather following heavy rain in the spring of 1941, Katahdin and Triumph potatoes in Louisiana were attacked by a sudden wilt of the aerial organs and tuber rot. Isolations from the tubers, the consistency of which was firm and their interior of a smoky grey colour, yielded cultures identified as *Pythium debaryanum*. Inoculations with this material induced a decay similar to that observed in the field and quite distinct from pink rot (*Phytophthora erythroseptica*) [*R.A.M.*, xx, p. 32], which was used in parallel tests. The *Pythium* rot appears to differ from other forms of tuber disorganization known in the United States, being comparable in some respects to the disease caused by *P. butleri* in Cyprus [ibid., xvi, p. 20].

LITTAUER (F.). **Sclerotium bataticola (Taub.) Butler on Potatoes in Palestine.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 142–147, 2 figs., 1944.

Infection of potatoes by *Sclerotium bataticola* [*Macrophomina phaseoli*: *R.A.M.*, ix, p. 561] in Palestine assumes three different forms, viz., stem blight and root rot, dry stem-end tuber rot, and black or charcoal tuber rot. In the first the whole plant suddenly turns yellow and later withers. The stem cortex sloughs off, exposing a dry, greyish xylem, and the pith is partly destroyed and filled with whitish, later black, sclerotia. These bodies are also found on the roots and stolons. In dry stem-end tuber rot, a black, sunken area develops round the stem end of the tuber. A cavity about 10 mm. deep, filled with collapsed tuber tissue, black sclerotia, and greyish, cottony mycelium, forms under the epidermis, being separated from the healthy tissue by a layer of suberized cells. The rot generally remains localized, and in most cases the stolon is also affected. In charcoal tuber rot, black spots 2 to 3 mm. in diameter encircle the light-coloured lenticels. The skin is unaffected, only the flesh beneath it being blackened. When the skin with the lenticels is peeled off, the spots in the flesh appear uniformly black. The spots are granulate and extend into the flesh to a depth of 2 mm. A soft rot, probably due to secondary bacteria, develops from these spots, and the tuber disintegrates. Even slightly affected tubers are unfit for culinary or seed purposes.

These diseases are widespread in Palestine, but attack is limited to crops grown in late spring. All the varieties at present grown are affected. Stem blight is not very frequent, but whenever it appears the losses are severe. Tuber rot is widespread and may cause very considerable damage, up to 5 per cent. of the tubers being affected at lifting and up to 50 per cent. losses occurring in storage.

In culture, the optimum temperature for sclerotial development ranged from 25° to 35° C. In inoculation tests, the fungus failed to cause infection even in wounded tubers at 25° to 40°, but when the tubers were heated for two hours at 55°, subsequent inoculations succeeded.

Control consists in avoiding high soil temperatures during the growth of the spring crop by the use of early varieties, early sowing and lifting, the choice of suitable and not excessively light soil, and frequent irrigation until shortly before

lifting. When lifted, the tubers should at once be placed in cool sheds and all those affected by disease, wounds, or heat discarded. The crop should then be stored in cold storage or in as cool and dry a store as possible. Storage in dry sand will reduce the risk of infection by contact.

PALTI (J.) & MOELLER (S.). **Trials for the control of powdery mildew on Potatoes.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 148–156, [1944].

Potato powdery mildew (*Oidium* sp.) was first recorded in Palestine in an epidemic form in the autumn of 1941, again in the spring of 1942, and then in the spring and autumn of 1943. It has been widely prevalent in the northern parts of the country, in Galilee, the Jordan Valley, and the Valley of Esdraelon, but seldom found in southern Palestine. The symptoms generally appear first on the haulms, leaf stalks, and leaf veins, and consist of brown lesions of various sizes bearing minute, dark brown stripes. As the disease progresses a whitish covering appears on the lesions.

Experimental evidence demonstrated that sulfinette and cita lime-sulphur sprays used at 1·5 per cent. strength almost entirely suppressed the disease. The sulphur spray spersal, in combination with perenox, was also effective. In one test, Gaza sulphur (extra fine grade) gave equally satisfactory results. Bordeaux mixture, perenox, and cuprogreen concentrated had much less effect, though the addition of light-medium white oil to perenox slightly increased its effectiveness. The application of lime-sulphur sprays through the overhead irrigation system in one trial checked the disease as successfully as did applications by the usual methods. Lime-sulphur at 1·5 per cent. produced slight foliage scorching. It is recommended that treatments should start when the first symptoms appear, and should be repeated at intervals of 10 to 14 days until three to four weeks before lifting. Powdery mildew reduces yield only when infection occurs during the first two months of growth, when yields may be reduced by 20 per cent. or more, and grade composition be adversely affected.

KRAMER (M.) & FRANCO DO AMARAL (J.). **A identificação da 'murcha bacteriana' presente em culturas da Batatinha do Estado de São Paulo.** [The identification of 'bacterial wilt' present in Potato crops in the State of São Paulo.]—*Biológico*, x, 7, pp. 199–207, 2 pl., 1944. [English summary.]

A description is given of bacterial wilt of potatoes (*Phytomonas* [*Xanthomonas*] *solanacearum*), based on field observations and laboratory experiments in São Paulo, Brazil [*R.A.M.*, xvii, p. 57]. The disease has also been reported from Rio Grande do Sul, Minas Gerais, and Paraná. Positive results were given by inoculation tests on potatoes and tomatoes, both by planting in soil with an admixture of crushed infected potato tubers and stems and by the introduction of the bacterial exudate into the stems through needle punctures. In a test in which eight tubers each of Eigenheimer and Konsuragis were planted in pots of infested soil on 11th November, 1943, 87·5 per cent. wilt developed in the course of the next two months, the corresponding figures for the same two varieties and Bintje (12 tubers of each) planted in the field on the same date being 75, 42, and 25 per cent., respectively. The causal organism was recovered from the diseased plants.

Botanical and Mycological Department.—*Rep. Rubb. Res. Bd Ceylon, 1943*, pp. 5–12, 1944.

This report [cf. *R.A.M.*, xxiii, p. 148] quotes the statement of an observer that during 1943 the attack of *Oidium* disease of rubber [*O. heveae*] in the Matale district of Ceylon was the worst yet experienced there. Infection was also severe in Uva and Moneragala. In the wet, low-country areas there was a sharp attack during

the main refoliation season, which on many estates caused a substantial loss of foliage. In some localities, late-wintering clones were also severely attacked.

In low-country districts, damage caused by *Diplodia* die-back [cf. ibid., xxi, p. 97] of young budded trees affected by *O. heveae* was unimportant, but on one estate at 1,000 to 1,500 ft., 10 per cent. of the trees were affected and 2 per cent. had died down to the main stem. The outbreaks appeared to follow on a weakened condition resulting from severe infection by *O. heveae*.

Secondary leaf fall due to *Phytophthora palmivora* was less severe than in 1942, but it led to loss of foliage on many low-country estates during the south-west monsoon. Die-back of green shoots of young budded plants, caused by the same fungus, was also found on some estates. The annual defoliation produced by *O. heveae* and *P. palmivora* in the chief country districts, while less spectacular than that due to *O. heveae* at higher elevations, undoubtedly exercises a serious cumulative effect on the health of the trees.

A severe outbreak of canker of the renewing bark of budded trees showed the existence of marked differences in clonal susceptibility. Experimental evidence demonstrated that regular application of the standard estate disinfectant at a higher concentration prevented further serious damage. It also appears that once the disease has passed its initial stages, painting with disinfectants is not likely to cure it, excision of the damaged bark being necessary to prevent further extension. A strain of *Phytophthora* was isolated from the affected bark of clone MK 3/2.

Pink disease (*Corticium salmonicolor*) was recorded on four-year-old buddings of clone Pilmoor B/84, reported to be susceptible from Java.

A serious outbreak of *Fomes lignosus* in a young replanted area, interplanted with cassava, was ascertained to have originated from old rubber roots, the cassava having helped the spread of infection to the young trees. Cassava can serve as a useful indicator of the presence of *F. lignosus* if the tubers are carefully inspected at harvesting, but if the disease is overlooked, successive plantings of cassava can lead to an alarming increase in spread.

Oidium leaf disease. The technique of sulphur dusting.—*Adv. Circ. Rubb. Res. Scheme Ceylon* 22 (*Suppl.*), 5 pp., 1944.

The notes on the technique of sulphur-dusting against *Oidium* [*heveae*] disease of rubber embodied in *Adv. Circ. Rubb. Res. Scheme Ceylon* 22, and first published in 1934 [cf. *R.A.M.*, xiii, p. 801], are brought up to date in the present *Supplement*. In this it is stated that the importance of beginning the dusting early cannot be over-emphasized, because if the fungus is allowed unrestricted development from the first it becomes almost impossible to control it without very large quantities of sulphur. As regards dosage and intervals between applications, programmes should be kept very flexible. If an application at a pre-arranged rate does not show signs of controlling the fungus, it may be necessary to make the next one at a substantially increased rate and after a shorter interval. This may prove to be an economy in the end, by enabling the rate of subsequent applications to be reduced.

Smith (N. R.) & Dawson (Virginia T.). **The bacteriostatic action of rose bengal in media used for plate counts of soil fungi.**—*Soil Sci.*, lviii, 6, pp. 467–471, 1944.

The acid media in common use for plate counts of soil fungi were compared with substrata of the same composition adjusted to a neutral reaction and with the addition of rose bengal at a concentration of 1 in 15,000. The best results were obtained with glucose-nitrate soil extract agar plus rose bengal, which eliminated all the Actinomycetes and most of the bacteria and reduced the spreading of fungal

colonies to a minimum. At P_H 4·2 the numbers of fungi on all the media tested were lower than at P_H 6·8 with the admixture of rose bengal, which may also be incorporated with peptone-containing substrata; the latter, however, permit the development of at least twice as many bacteria as the glucose nitrate-soil extract agar, while the fungal colonies are fewer and less sharply differentiated.

RAPER (K. B.) & THOM (C.). **New Aspergilli from soil.**—*Mycologia*, xxxvi, 6, pp. 555–575, 6 figs., 1944.

Full descriptions with Latin diagnoses are given of the following five new species and one new variety of *Aspergillus* isolated from southern or tropical soils, viz.: *A. janus*, *A. janus* var. *brevis*, *A. caespitosus*, *A. granulosus*, *A. panamensis*, and *A. sparsus*.

THOMPSON (L. C.) & BROWN (B. M.). **Laboratory brewing trials with varieties of Hops showing some resistance to Verticillium wilt.**—*J. Inst. Brew.*, N.S., xlii, 1, pp. 39–40, 1945.

In laboratory brewing trials in 1943 and 1944 of some Wye seedlings resistant to *Verticillium* [*albo-atrum*: see above, p. 165] and two commercially grown Beltring Golden type varieties, the two Beltrings 1140 and 1147 and the Wye seedlings, OB53, OJ47, and OR55 were found to be acceptable to the trade.

MUNGOMERY (R. W.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas. Qd, 1943–44*, pp. 21–24, 1944.

During the year under review [cf. *R.A.M.*, xxiii, p. 149] gumming disease (*Bacterium* [*Xanthomonas*] *vasculorum*) of sugar-cane was observed only on nine farms at harvest time in the Hambledon area, and by June this number was reduced to two. The direct loss from gumming is negligible, but the indirect loss will remain considerable till the disease is eradicated from the districts concerned. In the usual gumming-disease resistance trial at Brisbane of the new seedlings from the Experiment Stations, Q. 10 and Q. 45 were apparently highly resistant while Q. 13 and Q. 42 showed only a few streaks.

Downy mildew (*Sclerospora sacchari*) is under control in the northern areas. At Mossman only one farm is known to be infected; at Hambledon twenty stools were rogued from one field before ploughing-out and no other outbreak has occurred: no diseased stools were seen at Mulgrave or in the Herbert River district. With the decline of the disease, arrangements have been made to return the susceptible variety P.O.J. 2878 to the approved variety lists for all Mackay mills and to propagate the Bureau seedling, Q. 45, which had been held in abeyance. Since it could not be absolutely certain that the disease had been eliminated, the whole district has been proclaimed a quarantine area within which permits are necessary for the transfer of P.O.J. 2878 plants. Several hundred permits for the planting of this variety in 1944 have already been issued. In the Bundaberg district there has been a very marked increase in the disease; 4,013 stools were found in 18,153 acres inspected, all on the red volcanic soil of the Woongarra district, the scene of previous severe outbreaks. Some of the increase can probably be attributed to inability of the farmers, on account of shortage of labour, to harvest or plough-out diseased blocks. A special effort has been made this year to prevent the standing-over of diseased cane. Two downy mildew resistance trials were conducted during the year. At Meringa, in tests mostly of new seedlings, B. 306, B. 235, C. 277, Badila, B. 294, B. 307, B. 233, Hind's Special, B. 254, S.J. 2, S.J. 4, B. 230, and N.G. 16 showed no infection. In the Bundaberg trial, B. 5, B. 30, I. 11, I. 15, Q. 13, Q. 27, Q. 42, Q. 47, 32-8560, and CP. 29/116 remained free from the disease.

Fiji disease infection has also increased considerably in the Bundaberg district,

6,000 affected stools having been found in the 18,153 acres inspected. Part of the increase is due to labour shortage which prevented the removal of diseased cane. Quarantine proclamation No. 16 prohibits the planting of P.O.J. 2578, P.O.J. 2725, and Q. 25, thus cutting down the list of approved varieties very drastically. Increased planting of vigorous and commercially resistant C.P. 29/116 should ease the situation, though this variety is liable to arrow and is rather low in sugar early in the season. In the Isis area the disease showed a marked decrease, only eight diseased stools being found on four farms, and in the Maryborough district no Fiji disease was found in Island Plantation, once one of the worst-infected places in Queensland. In the Moreton Mill area the disease is only prevented from getting out of hand by sustained inspections and roguings, combined with a close watch on the sources of plants. Virtually the only conclusion to be drawn from the Fiji resistance trial concluded during the year was the extremely high susceptibility of the Hawaiian canes 32–1063 and 32–3575.

The small amount of leaf scald (*Bact.* [*X.*] *albilineans*) in the northern mill areas is of little economic importance. Top rot (*Phytomonas* [*X.*] *rubrilineans*) occurred as usual throughout the State but, except in the far north, where it was somewhat more severe than usual, was not much in evidence. Mosaic disease, though fairly widespread, was nowhere concentrated: it has increased somewhat in the variety Comus, while in the Mackay district at Bundaberg two of the new varieties, Q. 25 and Q. 42, are rather susceptible and will have to be watched closely.

SILVEIRA (V. D.). **Notas fitopatológicas e micológicas VII, VIII.** [Phytopathological and mycological notes VII, VIII.]—*Bol. Soc. brasil. Agron.*, vii, 1, pp. 33–36; 2, pp. 95–100, 8 figs., 1944.

Speira heptaspora (Garov.) Sacc., characterized by longitudinally septate, obovate conidia, 50 to 60 by 25 to 30 μ, was collected in Minas Gerais, Brazil, on fragments of dead tissue of a Coccid, which it had enveloped in a profuse sooty coating.

Phaeoisariopsis [*Isariopsis*] *griseola* was the agent of a bean leaf spot in the same State. *Macrosporium* [*Alternaria*] *porri* caused the development of purple spots on onion foliage in Rio de Janeiro [*R.A.M.*, xxii, p. 509]. *Abelmoschus* [*Hibiscus*] *esculentus* leaves were attacked by *Cercospora hibiscina* in the Federal District.

Septoria oleandrina produced on oleander foliage at Petropolis, Rio de Janeiro, well-marked, irregular, sunken lesions with white centres and dark red margins. *Corticium salmonicolor* was found causing a stem canker on a two-year-old *Eucalyptus alba* tree at Rocha Leão, where a reafforestation project is being carried out by the Leopoldina Railway Company. The same fungus had previously been observed on poplar in Baía in 1935.

Rose leaves in the Federal District were infected by *Actinonema* [*Diplocarpon*] *rosae*. Dead orchid rhizomes at the Coronel Pacheco Station were invaded by *Stemonites fusca*.

HIRSCHHORN (ELISA). **Revisión de les especies de Tilletia de la Argentina.** [Revision of the species of *Tilletia* of Argentina.]—*Rev. Mus. La Plata*, N.S., v, pp. 1–20, 3 pl., 3 figs., 1942. [English summary. Received November, 1944.]

This is a critical revision of the species of *Tilletia* occurring in Argentina, namely, *T. eremophila* on *Muhlenbergia asperifolia*, *M. disticophila* (a new host), *M.* sp., and *Eragrostis eremophila*; *T. hypsophila* on *Stipa tenuissima* and *Piptochaetium montevidense* (a new host); *T. fusca* var. *patagonica* n.var., with golden-brown, globose, reticulate chlamydospores, 20 to 26, 23·5 to 26, or 21 to 23 μ in diameter on *Festuca bromoides*; *T. tritici* [*T. caries*] on summer and durum wheat and

Petkus rye; and *T. levis* [*T. foetida*] on summer wheat, *Triticum polonicum*, and rye [*R.A.M.*, xxi, p. 249].

Among the points discussed are the analogies between (a) *Tilletia hypsophila* and *T. hyalospora* and (b) *T. eremophila*, *T. muhlenbergiae*, and *T. decipiens* [ibid., xvii, p. 841]; the morphological instability of *T. caries* and its resemblances to *T. secalis* and *T. triticina*; and the anomalies in the promycelial structure of *T. caries* and *T. foetida*.

The paper comprises a key for the determination of the species and is supplemented by a bibliography of 54 titles.

KARLING (J. S.). **Brazilian Chytrids. IV. Species of Rozella.**—*Mycologia*, xxxvi, 6, pp. 638–647, 28 figs., 1944.

A critically annotated list is presented of five monosporangiate species of *Rozella* [*R.A.M.*, xxi, p. 351], including *R. laevis* parasitic on *Pythium* sp. resembling *P. gracile* [ibid., xxiv, p. 75] from soil and one polysporangiate species, *R. achlyae*, in the sporangia of *Achlya flagellata*, isolated in water cultures in Rio Negro.

VIÉGAS (A. P.) & TEIXEIRA (A. R.). **Alguns fungos do Brasil (Phycomycetos).** [Some fungi of Brazil.]—*Bragantia, S. Paulo*, iii, pp. 223–245, 22 pl. (1 col.), 4 figs., 1943.

The following are among the records in this annotated list of Phycomycetes collected in São Paulo, Brazil: *Plasmodiophora brassicae* on cabbage, *Spongospora subterranea* on potato tubers imported from Holland, *Physoderma zeae-maydis* [*P. maydis*] on maize, *Albugo* [*Cystopus*] *bliti* on *Amaranthus* sp. [*R.A.M.*, xi, p. 75], *A. candida* [*C. candidus*] on radish and mustard, *A.* [*C.*] *ipomoeae panduratae* on sweet potato [ibid., viii, p. 11], *Phytophthora citrophthora* on citrus, including lime and orange, *P. infestans* on Argentinian and European potato varieties, *Pythium debaryanum* on potato and *Myrciaria* [*Eugenia*] *jaboticaba* fruits, *Bremia lactucae* on lettuce, *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* on Cucurbitaceae, including melon, *Peronospora effusa* on *Chenopodium hircinum*, *P. parasitica* on cabbage and broccoli, *Plasmopara halstedii* on *Ageratum conyzoides*, *P. viticola* on vine (*Vitis labrusca* var. *isabela*), *Empusa* [*Entomophthora*] *aphidis* on potato aphids, and *Empusa dysderci* on *Dydercus* spp., including *D. mendesi* and *D. rufi-collis* [ibid., xix, p. 148].

BOND (T. E. T.). **The 'phloem necrosis' virus disease of Tea in Ceylon. II. Field observations and effect on yield.**—*Ann. appl. Biol.*, xxxi, 4, pp. 300–310, 4 graphs, 1944 [1945].

After briefly discussing the difficulty of diagnosing tea phloem necrosis [*R.A.M.*, xxiii, p. 362] in the field, the author presents evidence indicating a frequency of at least 25 per cent. diseased bushes for the aggregate acreage of tea above 6,000 ft. in Ceylon. As regards diagnosis, the problem is to combine rapidity with accuracy. An average of half a minute or less is all that can be allowed for each bush in field work, so that diagnosis is virtually confined to the detection in the petiole of a few leaves picked from different parts of the bush. Advanced cases are readily recognizable, but others may be overlooked, and, on the other hand, 'false necrosis' [ibid., xxii, p. 43] may increase the apparent incidence. In practice, three categories are recorded, healthy (H), suspect (S), and necrotic (N). The use of category S as, in fact, an early stage of the disease is justified by the high percentage (up to 95 per cent. in the experiments so far recorded) of suspected bushes that later became necrotic. In view of the difficulties of diagnosis, any record of incidence can only be an estimate of the situation when the record was made. Hence, in following the progress of the disease two methods are possible, one being to take the records as they stand, and the other to use the cumulative total of

necrotic and suspect bushes, treating all N and S records as of equal value. In this work the latter method was used in roguing experiments, while for most other purposes the actual percentage of N and S bushes was used.

The evidence obtained failed to demonstrate any general tendency for the yield of affected estates to decline. Two apparently representative estates showed a decline in yield from 1929 to 1930, followed by recovery four or five years later. The most severely affected fields in both show a decline in yield relative to the estate as a whole of not over 19 lb. of made tea per acre per annum or 3·3 per cent. of the mean yield during the past ten years. Emphasis is laid on the great variability in individual bush yields, and the conclusion is reached that the elimination of unproductive bushes and their replacement by a type which has so far remained unaffected, though possibly carrying the virus, will more than counteract the effect of the progressive deterioration of the necrotic bushes remaining.

The distribution of affected bushes is irregular, and the rate of spread in different areas highly variable, incidence sometimes doubling in periods ranging from 3½ years to under one year.

In two experiments, complete roguing of all N and S bushes at intervals of six months reduced the rate of spread to about one-third of that in the controls.

ATKINSON (NANCY). **The serology of the Tobacco mosaic virus.—The action of various salts and salt concentrations in the agglutination reaction.**—*Aust. J. exp. Biol.*, xxii, 4, pp. 231–236, 1944.

Tests were conducted in various concentrations of sodium chloride and a number of other salts and solutions in an endeavour to find the most suitable medium for studies on the serology of tobacco mosaic virus [*R.A.M.*, xxi, p. 425]. The serological optima and the end titre of the antiserum did not remain constant. The system appeared less susceptible to variations in technique in potassium phthalate or potassium malate than in sodium chloride solutions. The variation in the serological results is attributed, at any rate in part, to the nature of the antigen.

SMITH (K. M.). **Transmission by insects of a plant virus complex.**—*Nature, Lond.*, clv, 3928, p. 174, 1945.

Studies on tobacco rosette [*R.A.M.*, xx, p. 449] have shown that it consists of two undescribed viruses, for which the names 'vein-distorting' and 'mottle' viruses are suggested. The former cannot be transmitted mechanically, but is dependent upon an aphis vector, while the latter is easily transmitted by sap inoculation. All attempts to transmit the mottle virus by aphis vectors failed unless it was accompanied in the plant by the vein-distorting virus.

In one typical experiment, a White Burley tobacco plant infected with the mottle virus was colonized with *Myzus persicae*, the insects being removed after the requisite feeding period and colonized on 12 young tobacco seedlings, using five to ten aphids per plant. All 12 plants remained unaffected. The mottle plant was then infected by means of aphids with the vein-distorting virus, and in due course developed the rosette-virus complex. It was then once more colonized with virus-free aphids which, after feeding, were transferred to 12 tobacco seedlings, one aphid being placed on each. Nine of the 12 seedlings developed rosette.

When the aphid has picked up both viruses, it retains them both for long periods, and in successive transfers at intervals of 24 hours it can infect 20 plants consecutively without resort to a fresh source of virus. Once infected with the virus complex, the aphid, in a series of transfers, sometimes transmits either virus alone and sometimes the whole complex. It is suggested that other viruses which are apparently not insect-borne when alone may be so transmitted in the presence of another virus.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

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WILSON (J. D.) & RUNNELS (H. A.). **Latest method on anthracnose control.**—*Food Packer*, xxvi, 1, pp. 54–55, 1945.

Data are presented from 12 of the 17 replicates of the 1944 co-operative experiment on the control of tomato anthracnose [*Colletotrichum phomoides*: *R.A.M.*, xxiv, p. 168], in which three treatments were used, viz., fermate+calcium arsenate 2–4–100, tribasic+calcium arsenate 4–4–100, and the same two formulae in alternating applications beginning and ending with fermate. The average incidence of infection in the plots receiving three treatments, in the order as given, and in the controls was 5, 7·29, 4·65, and 13·66 per cent., respectively, the yields per 50 plants 526, 534, 534, and 492 lb., respectively, and the crop value $259, 274, 281, and 237, respectively.

RIGG (T.), KIDSON (E. B.), & CHITTENDEN (E. T.). **The effects of steam and soil disinfectants on the yield and quality of Nelson Tomatoes under outside culture.**—*N.Z. J. Sci. Tech.*, A, xxvi, 4, pp. 183–186, 1944.

A great improvement in the growth, yield, and quality of Potentate tomatoes was effected in experimental plots at Nelson, New Zealand, by steaming the soil to a depth of 14 in., using a grid at a pressure of 100 lb. per sq. in., and by the application of 40 per cent. formalin at the rate of $\frac{1}{6}$ gal. per sq. yd. Production was increased by nearly 25 per cent. by both treatments, and the incidence of 'hard core', a common defect characterized by a hard, pithy condition of the flesh, especially at the stalk end, which prevents ripening and severely impairs the culinary and canning value of the tomatoes, was reduced from 48·2 to 26·3 and 9·4 per cent. by formalin and steaming, respectively.

RALEIGH (S. M.) & CHUCKA (J. A.). **Effect of nutrient ratio and concentration on growth and composition of Tomato plants and on the occurrence of blossom-end rot of the fruit.**—*Plant Physiol.*, xix, 4, pp. 671–678, 1944.

A tabulated account is given of investigations at the Maine Agricultural Experiment Station in 1939 and 1940 to determine the effects of different nutrient ratios and concentrations on tomato growth, chemical composition, and tendency to blossom-end rot [*R.A.M.*, xvi, p. 502]. The plants (Marglobe) were grown out-of-doors in 2-gal. crocks filled with sieved and washed silica sand and supplied with solutions of six major elements by the subirrigation method (*J. agric. Res.*, liii, pp. 693–702, 1936). Blossom-end rot developed at comparatively low osmotic values, and in no instance could the disorder be attributed to the osmotic value. The disorder was induced by high nitrogen, high sulphur, high magnesium, high potassium, high chlorine, and low calcium, and the evidence indicated that the balance between the elements is a more important factor than the actual concentration of the elements or the osmotic concentration of the solution. It also appears that the unbalanced condition causes the disorder by preventing the utilization of the necessary amount of calcium for normal fruit production, for in the experiment recorded, whenever the calcium content of the fruit fell below 0·20 per cent. blossom-end rot generally occurred on some of the fruits.

CLARKE (E. J.) & SHERRARD (G. O.). **A leaf-spot on Tomatoes and its relationship to the variety Vetomold.**—*Gdnrs' Chron.*, Ser. 3, cxvii, 3034, p. 71, 1945.

The performance of the Vetomold tomato in Eire has been generally disappointing, since notwithstanding its immunity from leaf mould (*Cladosporium*) [*fulvum*], it yields only about half as much as a heavy-cropping susceptible variety, such as Scarlet Knight. In addition to this and other undesirable features, Vetomold has proved unsuitable as a parent in crosses with superior commercial tomatoes, mainly owing to an apparently constitutional defect behaving as a recessive character and expressed by the development on the leaf blades of pale yellow-green, rather small spots of indefinite outline, which gradually expand and often coalesce into large, irregular necrotic areas with red-brown centres. In experiments at the Albert Agricultural College, Glasnevin, Dublin, there was a quasi-complete negative correlation between the occurrence of this disorder and leaf mould in the progeny of crosses between Vetomold and commercial varieties. Thus, out of 75 F_2 plants of Vetomold × Scarlet Knight, 39 were healthy, 17 were affected by leaf spot, 18 by *C. fulvum*, and only one by the two diseases together, the corresponding proportions for 77 of Vetomold × Victory being 32, 20, 15, and 0, respectively. A similar relationship holds good with other leaf mould-resistant strains, as exemplified by a cross between Ailsa Craig and one of the latter, from which four F_4 families were selected containing, respectively, 18, 19, 19, and 17 plants. Of these, family (1) comprised 3 healthy, 13 with leaf spot, two with leaf mould, and 0 with the latter disease suppressed and without leaf spot; the corresponding figures for (2), (3), and (4) were 2, 15, 1, and 1; 3, 4, 2, and 10; and 1, 0, 6, and 10, respectively.

Even before the advent of Vetomold, the form of leaf spot under observation was familiar to the writers in a leaf mould-resistant strain imported from Massachusetts, in selections from which and crosses with commercial varieties it has since developed sporadically. It is also a feature of crosses between the Canadian Allred, introduced in 1939, and commercial varieties. Leaf spot has further been reported from various Dublin nurseries as occurring in crosses between Vetomold and standard varieties in an approximate 3 : 1 ratio, and is believed to be present in other parts of Eire.

[DAY (W. R.).] **Forest pathology.**—*Rep. Imp. For. Inst., Oxford, 1943–44*, pp. 7–8, 1944.

In this report [cf. *R.A.M.*, xxiii, p. 200] it is stated that Corsican pine [*Pinus nigra* var. *calabrica*] in England and Wales is suffering from a widespread and locally serious die-back due to frost injury. Severe needle cast associated with *Hypodermella sulcigena* [ibid., xix, p. 54] was also recorded, but no die-back was associated with this, and there is hope that no permanently serious injury will result. Both diseases were most serious in situations where the air was stagnant and good early growth favoured.

Specimens of poplar, willow [*Salix*], and cherry showing canker due to frost injury were received from various parts of Scotland and England.

Bacterial canker of poplar [ibid., xiii, p. 408; xviii, p. 68] continues to spread on susceptible types, such as *Populus eugenii*. In the south of England, *Stereum spadiceum* [ibid., xvi, p. 4] caused serious rot throughout an oak wood.

LOHWAG (H.). **Zum Sterben der Bäume im Lainzer Tiergarten (Wien).** [On the dying-off of the trees in the Lainz Zoological Garden (Vienna).]—*Zbl. ges. Forstw.*, lxviii, 10, pp. 179–197, 10 figs., 1942. [Received 1944.]

Wood-destroying fungi responsible for the increasingly heavy losses observed of late years among the magnificent trees of the Lainz Zoological Garden, Vienna

[cf. *R.A.M.*, xxiii, p. 368], include *Fomes fomentarius* and *Ganoderma laccatum* on beech, *Polyporus sulphureus* on various hard- and softwoods, *Fomes hartigii* on fir (*Abies*) [ibid., xxi, p. 56], *F. robustus* and *Phellinus* [*Polyporus*] *dryadeus* on oak [loc. cit.], and *P. squamosus* (relatively rare in the Zoological Garden but common on limes (*Tilia*), planes [*Platanus*], and *Celtis* in parks and gardens).

ZENTMYER (G. A.), WALLACE (P. P.), & HORSFALL (J. G.). **Distance as a dosage factor in the spread of Dutch Elm disease.**—*Phytopathology*, xxxiv, 12, pp. 1025–1033, 1 diag., 1 graph, 1944.

The statistical analysis of data from three plots used for studies on the spread of Dutch elm disease (*Ceratostomella ulmi*) from large, naturally infected trees in Connecticut showed that the probability of attack on a given tree decreased directly with the logarithm of the distance from the source of contamination. The mode of spread of the pathogen thus conforms to the dose-response relation observed in other scientific fields [cf. *R.A.M.*, xxii, p. 72].

By calculating regression equations for each plot and comparing the variations by a chi-square test, the data were found to be homogeneous, that is to say, the three equations could be combined to give one regression line, which is useful in determining the probabilities of infection of trees at varying distances from the focus centre and consequently significant in the organization of local control measures.

Of the new infections on the three plots, 75 per cent. were within 100 ft. of the original diseased trees, and 40 per cent. of the elms within 75 ft. of this focus contracted the disorder. The distance of dissemination of the fungus was about twice as long to the north as to the south of the plot centres (50 and 25 ft. respectively, for 50 per cent. infection), this difference being on the verge of significance. Prevalent south winds during beetle (*Scolytus multistriatus*) emergence apparently accounted for the discrepancy.

FELT (E. P.). **Dutch Elm disease control.**—*Sci. Tree Top.*, i, 8, pp. 58–64, 1 fig., 1943.

As a result of the transference of the responsibility for Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xxii, p. 504 *et passim*] control from Federal and State agencies in the older affected areas of the north-eastern United States to municipal authorities and property-owners, the accumulated benefits of the original attempts at eradication are stated to be rapidly disappearing. Local authorities are urged to take cognizance of the implications of this changed policy and make adequate provision for control in order to save thousands of valuable trees, the loss of which would be irreplaceable in the present generation.

MUMENTHALER (E.). **Das Ulmensterben in Bern.** [The dying-off of Elms in Berne.] —*Schweiz. Z. Forstw.*, xcv, 2, pp. 50–52, 1 fig., 1944.

During the winter of 1943–4, the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) necessitated the felling of 300 of the 1,096 trees infected by the fungus in the city of Berne out of a total population of 3,116, an operation which had to be performed by skilled workers, and cost the municipal authorities Fr. 75,000. Some of the elms destroyed on account of the disease were over 250 years old. Since its first appearance in the locality in 1929, the pathogen has steadily increased in virulence and all the chemical and mechanical control measures tested for its control have proved unavailing.

Large strips of bark from two of the felled trees, both with about 90 annual rings and a basal diameter of 90 cm., presented the appearance of being peppered with shot holes—the channels of entry of the elm bark beetle (*Scolytus scolytus*),

which in its winged phase conveys the inoculum from tree to tree. Thus, the elms are victims of a combined attack by the beetle and fungus.

Measures directed towards the extermination of the insect would involve the collection and destruction of eggs, larvae, and pupae, and are regarded as quite impracticable. It is possible, however, that repeated spraying with veralin in April and May might save some of the younger trees. The presence of woodpecker holes on the decorticated trunks points to the desirability of more effective protection for insectivorous birds. In the generality of cases the only remedy lies in felling the elms *in situ* and immediately burning the bark. The felled wood is in great demand for cabinet-making and the like.

RÜEDI (K.). **Buchenkrankheit im schweizerischen Mittelland.** [Beech disease in the Swiss interior.]—*Schweiz. Z. Forstw.*, xcv, 2, pp. 54–55, 1944.

The contention of H. Leibundgut and Louise Frick that the die-back of beeches in the Swiss interior is primarily attributable to the abnormally rigorous winter of 1939–40 [*R.A.M.*, xxiii, p. 200] is challenged by the writer on the grounds that (a) the disease was already affecting a number of trees in the Zürichberg State Forest in the late autumn and early winter of 1939, and (b) no such consequences followed the even more severe cold of February, 1929, when the thermometer fell to −6·7° C. compared with −5·5° in January, 1940. Thus the question of the part played by the associated fungus [*Nectria coccinea*] assumes greater prominence.

HEPTING (G. H.). **Sapstreak, a new killing disease of Sugar Maple.**—*Phytopathology*, xxxiv, 12, pp. 1069–1076, 3 figs., 1944.

'Sapstreak' is the name proposed for a new disease of sugar maples (*Acer saccharum*) in the Pisgah National Forest, North Carolina, where large numbers of trees, 8 in. and upwards in diameter at breast height, have been killed since about 1935 by *Endoconidiophora virescens*, formerly referred to *E. coerulescens* [*R.A.M.*, xxiv, p. 37]. Under the latter name the fungus has been reported as one of the most prevalent agents of sap stain in hardwood and occasionally pine timber in the United States. It invades the healthy sapwood, producing narrow, grey to reddish, radial streaks and water-soaked areas. The foliage of infected trees dwindles and pales progressively, death usually ensuing within two to four years of the first symptoms of crown-thinning. The inoculation of twelve large trees with rye cultures of the pathogen resulted in the death of two and severe infection of four within three years, re-isolations being effected in three cases. Any disease capable of such rapid destruction of 20-in. trees must be deemed of potential significance, and a close watch is being kept on its development in the affected zone.

The fungus is highly variable in culture; an isolate from an inoculated tree grew profusely at first, had a strong, sweetish, musty odour and sporulated freely, but after a year growth was much slower, had less odour, and bore much fewer spores. The hyphae of *E. virescens* are generally confined to the vessels, thus differing from the *Ceratostomella* spp. causing sap stain. Attention is drawn to a peculiar feature of the larger hyphae of *E. virescens*, which branch at some of the septa in the shape of a lyre. The 'lyre joints' have been found in profusion both in diseased maple wood and in sap-stained yellow poplar [*Liriodendron tulipifera*], but they are not mentioned by Lagerberg *et al.* in their description of *E. coerulescens* [ibid., ix, p. 76], nor have they been reported in connexion with other fungi.

BAGCHEE (K. D.). **Wilt and die back of Shisham, Babul and Khair in the artificial regeneration under agriculture-cum-forestry management.**—*Indian For.*, lxxi, 1, pp. 20–24, 1 pl., 1945.

Babul (*Acacia arabica*) in the irrigated plantations of Lower Sind, where the

trees are under artificial cultivation with cereals and cotton, was observed to be suffering from a similar sequence of pathological symptoms to the wilt and die-back previously reported on shisham (*Dalbergia sissoo*) in the Punjab and khair (*A. catechu*) in the United Provinces. A species of *Fusarium* has been isolated from diseased *D. sissoo* [*R.A.M.*, xvi, p. 146] and *A. arabica* roots, the cambium and sapwood of which show a soft, pinkish-brown rot, sometimes extending as narrow, linear streaks along the main stem, the bark of the sapwood peeling off easily. Inoculation experiments on *D. sissoo* roots in the field resulted in the development of typical wilt symptoms. In the case of *A. arabica*, a fungus of the sclerotial type was isolated jointly with the *Fusarium* and may also be concerned in the etiology of the disease. The organism associated with die-back in the above-mentioned and many other trees is the widespread *Ganoderma lucidum*, sometimes in conjunction with *Polyporus gilvus* and *G. applanatum* [*Fomes applanatus*]. Direct control of the wilt and die-back presents almost insuperable difficulties, and the remedy should therefore be sought in an improved silvicultural technique, since the present method of short rotation appears to be one of the factors predisposing the trees to invasion. Though the symptoms do not become apparent until five or six years after the germination of the seeds, infection probably takes place much earlier. Another disadvantage of frequent cultivation is the change induced thereby in the P_H value of the soil, with its attendant disturbance of the microflora concerned in the supply of nutrients to the trees. Systematic experiments are required to ascertain the optimum interval for rotation.

SCHWERDTFEGER (F.). **Die wichtigsten forstpathologischen Arbeiten der Jahre 1938 bis 1942. Kritische Übersicht.** [The most important investigations on forest pathology of the years 1938 to 1942. A critical survey.]—*Forstarchiv*, xix, 11–12, pp. 259–272, 1943.

Among the numerous items of interest in this critical survey of German and a few foreign studies on forest pathology covering the period from 1938 to 1942 [cf. *R.A.M.*, xvi, p. 643], the bibliography appended to which comprises 173 titles, the following, excluding those already noticed from other sources, may be mentioned. A. NĚMEC (*Forstw. Zbl.*, lxii, pp. 105–113, 1940) attributes the dying-off of a spruce stand on soil with an exceptionally high degree of exchangeable acidity to an insufficient supply of lime, which the trees unsuccessfully attempted to supplement by drawing on the ampler potash reserves.

A wilt and die-back of spruce shoots caused by *Ascochyta piniperda* [ibid., xviii, p. 219], widespread in Austria, is described by H. STEINER in *Dtsch. Forstw.*, xxii, pp. 353–354, 1940.

The question whether the incidence of decay in a spruce trunk, or the liability to such a condition, can be deduced from the external appearance of an injury, was answered in the affirmative by H. HAUFE (*Tharandt. forstl. Jb.*, lxxxix, pp. 100–134, 1938) after the examination of over 1,000 trees.

According to L. FABRICIUS (*Forstw. Zbl.*, lxii, pp. 262–266, 1940), if less than two-tenths of the spruce crown is spared from invasion by wood-destroying fungi, the trunk should be felled at an early date to obviate further depreciation. As a rule, however, these organisms do not encroach on the bole.

PEACE (T. R.). **The occurrence of Melampsora pinitorqua on Scots Pine in south-eastern England.**—*Forestry*, xviii, pp. 47–48, 1944.

Young Scots pine [*Pinus sylvestris*] in limited areas in four places in Kent and Sussex has suffered appreciable damage as a result of infection by *Melampsora pinitorqua* [*R.A.M.*, xxiii, p. 200]. The disease was first noticed in the autumn of 1942 on two patches of about an acre each at Vinehall Forest, near Battle, Sussex, and at Lyminge Forest, between Folkestone and Canterbury, Kent. At Vinehall,

the trees had been planted in 1937, and at Lyminge in 1938. The trees were festooned with dead shoots, and many apparently uninjured shoots bore small cankers. In May, 1943, typical fresh cankers, with rapidly developing caeomata of *M. pinitorqua* appeared abundantly in both localities. The alternate host, *Populus tremula*, was freely mixed with the pine in both areas and in June numerous uredosori were found on the aspen leaves. In both localities the aspens were therefore cut as low as possible in July.

In July, 1943, Scots pine planted in 1939 at Great Sanders, a few miles from Vinehall, was also found to be infected. Both at Vinehall and Lyminge less damage ensued in 1943 than in 1942. In 1944, infection was on a much smaller scale in both areas, and at Great Sanders also the lesions were far fewer. In the same year, the disease was found at Hemsted Forest, Kent, on Scots pine planted in 1941, but was causing much less damage than it had in earlier years. While aspen was abundantly present in the affected areas, it also occurred in places where no disease was present. If the damage had continued on the scale of 1942, the plantation would have become valueless in three or four years.

BALTHIS (R. F.) & ANDERSON (D. A.). **Effect of cultivation in a young Slash Pine plantation on the development of Cronartium cankers and forked trees.**—*J. For.*, xlii, 12, pp. 926–927, 1944.

In January, 1940, two adjacent one-acre plots were selected in typical cut-over longleaf pine [*Pinus palustris*] land in Newton County, Texas, in one of which 884 one-year-old slash pines [*P. caribaea*] were planted 6 by 8 ft. and received no further treatment, while the second, similarly planted, was clean-cultivated immediately before and at intervals after planting. In December, 1943, the cultivated trees were superior to the untreated in survival, height, and diameter, but they were also more extensively forked and infected by *Cronartium cerebrum* and *C. fusiforme* [*R.A.M.*, xix, p. 173; xxii, p. 231]. The uncultivated trees showed: percentage survival 88, average height 8 ft., average diameter at breast height of trees over 4½ ft. tall 1·36 in., percentage of trees with forked top 1·5, and percentage of trees with rust 8·6; the corresponding figures for the cultivated plot were 98·1, 11·3, 2·22, 4·6, and 14, respectively. The majority of limb cankers occurred at a height of 2 ft., the highest points of infection on the cultivated and uncultivated plots being 7½ and 4½ ft., respectively. Of 121 rusted trees in the cultivated plot, 112 bore cankers only on the limbs, six on the stem, and three on both, while in the uncultivated, 58 out of 67 were infected on the limbs and 9 on the stem. The higher percentage of infection on the cultivated trees is attributed by P. V. Siggers mainly to the difference in growth rate between the two lots, the cultivated probably producing succulent, susceptible tissue for longer periods than the untreated.

KIMMEY (J. W.) & MIELKE (K. L.). **Susceptibility to White Pine blister rust of Ribes cereum and some other Ribes associated with Sugar Pine in California.**—*J. For.*, xlii, 10, pp. 752–756, 1944.

A tabulated account is given of experiments carried out in northern California between 1940 and 1942 to determine the relative susceptibility to white pine blister rust (*Cronartium ribicola*) of different forms of *Ribes cereum*, *R. roezli*, *R. tularense*, and *R. montigenum* [cf. *R.A.M.*, xxiii, p. 122 *et passim*]. The Sequoia National Forest form of *R. cereum* may be tentatively rated as resistant, though it is capable of producing appreciable amounts of inoculum under conditions favourable to the rust. Similar considerations apply to the Lassen Park form. Both the foregoing are more susceptible than the forms of *R. cereum* tested in the neighbouring Feather River Meadows, and in British Columbia and Oregon. *R. tularense* and *R. montigenum* may also be provisionally classed as of moderate susceptibility and capacity for teleutospore production. A high degree of variability exists in the

reactions of *R. roezli* in northern California, where its average susceptibility has been found to be lower and its capacity for teleutospore production much greater than indicated by previous tests in British Columbia. The southern form of this species appears to be more susceptible than the northern.

HOBBS (C. H.). **Studies on mineral deficiency in Pine.**—*Plant Physiol.*, xix, 4, pp. 590–602, 4 figs., 4 graphs, 1944.

At Purdue University, Lafayette, Indiana, plants of pitch, red, white, and shortleaf pines (*Pinus rigida*, *P. resinosa*, *P. strobus*, and *P. echinata*) were grown in nutrient sand cultures in earthenware crocks to determine the symptoms and effects on growth of nitrogen, phosphorus, potassium, and magnesium deficiency. Shortage of nitrogen resulted in pallor (a typical symptom of this deficiency in general) and severe stunting in *P. rigida* and *P. echinata*, a destructive tan-coloured necrosis of the needles in *P. strobus*, and a reddening of the tissues in *P. resinosa*. Phosphorus deficiency [*R.A.M.*, xvi, p. 357] was expressed chiefly by stunting and necrosis of the lower needles (very slight in the case of *P. strobus*), sometimes accompanied by a pinkish-red tinge. Lack of potassium [ibid., xix, p. 52] resulted in a bluish-green discoloration of the seedlings and copper-coloured necrosis of the terminals in the rapidly growing *P. rigida* and *P. echinata*, while *P. resinosa* exhibited the former symptom but in this species and in *P. strobus* the necrosis involved the ends of the needles; white pine further showed a marked tendency towards chlorosis. The most prominent feature of magnesium deficiency [loc. cit.] was chlorosis of the needle tips, which subsequently became necrotic, while the discoloration gradually progressed downwards. The lack of this element did not cause such extreme reductions in growth as that of the other minerals.

SPAULDING (P.) & HANSBROUGH (J. R.). **Decay of logging slash in the Northeast.**—*Tech. Bull. U.S. Dep. Agric.* 876, 22 pp., 2 graphs, 1944.

The average periods required for the disintegration of logging slash (the debris left in the forest after cutting) to a point where it no longer constitutes a fire hazard are 15 years for hardwoods, 17 for eastern white pine (*Pinus strobus*) [*R.A.M.*, ix, p. 78], and 29 for red spruce (*Picea rubens*) [*P. rubra*]. Under the conditions most conducive to decay, these periods may be curtailed by about one-fifth. The primary factors governing the activities of the hundreds of slash-decay fungi, of which 50 or so are of primary importance, are moisture, temperature, and the resistance of the wood. Moisture is essential, but since air is also required, the fungi cannot work in completely waterlogged material. They make little or no growth below 40° F. and attain their maximum efficiency at or about 70°. The heartwood of the more durable species, e.g., oak, ash, sugar maple (*Acer saccharum*), red spruce, white pine, Canada hemlock (*Tsuga canadensis*), beech, and birch, decays much more slowly than the sapwood of any.

These factors may be modified by proper silvicultural operations. A short rotation, for instance, results in less slash per acre and a larger proportion of fast-decaying sapwood, with consequent early reduction of the volume to a relatively safe point. Partial cutting is also conducive to rapid decay, while clear cutting tends to retard it by inducing high temperatures and abnormal dryness. Scattered slash usually disintegrates faster than piled or windrowed.

OGILVIE (L.). **Diseases of vegetables.**—*Bull. Minist. Agric., Lond.*, 123, 74 pp., 21 figs., 1944. 1*s.* 6*d.*

The second edition of this very useful bulletin issued originally in 1941 [*R.A.M.*, xxi, p. 59] embodies considerable revision made in the light of recent work and experience. Some 60 pages are devoted to diseases of particular vegetable crops, their symptoms and control, and most of the remainder to control of diseases in

general. The work concludes with indexes of the parasites and the non-parasitic and virus diseases mentioned.

BOSWELL (V. R.). **Disease-resistant and hardy varieties of vegetables.**—*Nat. hort. Mag.*, xxiii, 2, pp. 59–63; 3, pp. 138–143; 4, pp. 203–208, 1944.

One of the first achievements in the breeding of disease-resistant vegetables in the United States dates from 1910, when J. B. Norton began to develop the Mary Washington asparagus variety for resistance to rust [*Puccinia asparagi*]. Other early accomplishments included the selection at the Wisconsin Agricultural Experiment Station of a cabbage (Wisconsin Hollander) resistant to yellows (*Fusarium*) [*conglutinans*] (1916); the production of the first watermelon (Conqueror) resistant to wilt [*F. bulbigenum* var. *niveum*] by workers in the Department of Agriculture (1911); and the crossing at the Virginia Truck Experiment Station about 1920 of a wild Manchurian spinach with Bloomsdale Savoy, the progeny of which combined the resistance to 'blight' [cucumber mosaic virus] of the former with the desirable marketing qualities of the latter, thereby saving the industry from collapse.

Reference has frequently been made in this *Review* to contemporary developments in resistance to bean mosaic and rust [*Uromyces appendiculatus*].

In the second and third instalments of his account, the author presents further information on resistance in cabbage to *Fusarium* [*conglutinans*]; in celery to yellows (*F.*) [spp. including *F. apii*: ibid., xiv, p. 419]; in maize to bacterial wilt [*Xanthomonas stewarti*]; in cucumbers to various diseases, including mosaic and scab [*Cladosporium cucumerinum*]; in muskmelons (the correct American term for the so-called 'cantaloupe') to powdery and downy mildews [*Erysiphe cichoracearum* and *Pseudoperonospora cubensis*] and wilt (*F.*) [*bulbigenum* var. *niveum*], the last-named disease also being discussed in connexion with watermelons. Most of the facts in the report are well known and have repeatedly been referred to in this *Review*, but mention may be made of the following items. In general, early open-pollinated varieties of sweet corn are much more susceptible to bacterial wilt than late ones, among the most important of the former being Early Golden Bantam, Golden Bantam, Golden Early Market, Golden Gem, Golden Sunshine, and Gill Market, while the latter include Country Gentleman, Stowell Evergreen, Howling Mob, and Long Island Beauty. Turning to the hybrids of proved value, Golden Cross Bantam (mid-season) is probably the best known and most widely cultivated, other early to mid-season resistant crosses being Marcross, Spancross, Whipcross, Tendergold, and Top Cross Maine Bantam. Indigold, Purgold, and Ioana are particularly well adapted to the Middle West. Late resistant hybrids include Country Gentleman, 8×6 and 5×10, Hybrid Evergreen, and Bantam Evergreen Hybrid.

Cucumber scab is generally troublesome only in the north-east, where the black-spined variety Maine No. 2 should be grown for pickling. Chinese Long and Tokyo Long Green are commercially undesirable, but are in extensive use as parents on account of their resistance to mosaic and downy mildew.

In 1943, a new cantaloupe of the Hale Best type, Powdery Mildew Resistant No. 5, showing resistance to both races, 1 and 2, of *E. cichoracearum* [ibid., xxii, p. 193], was released and is expected to be planted throughout almost the whole of the Imperial Valley, California, in 1945. Much more serious and widespread than powdery is downy mildew, and hitherto (1944) none of the commercially available varieties has exhibited any noteworthy degree of resistance. Golden Gopher and Iroquois are highly resistant to wilt, the former being particularly suitable to the north-central region, while the old, well-known varieties, Burrell Gem, Paul Rose, and Pollock 10–25 are fairly tolerant of the disease.

Most of the Iowa Agricultural Experiment Station's many wilt-resistant water-

melons have been superseded by Kleckley No. 6 [ibid., xii, p. 269], resembling its parent Kleckley Sweet, and Stone Mountain No. 5 [ibid., xvi, p. 369], both of which are adapted to Middle West conditions. Leesburg, a Florida derivative of Kleckley Sweet, and the Australian Hawkesbury do well in the south, while Klondike R7 has been developed in California for cultivation in the west.

The Marblehead and Long White Bush squashes and some strains of vegetable marrow are resistant to curly top, as are also Big Tom, Cushaw, Large Cheese, and Tennessee Sweet potato pumpkins.

MILLER (P. W.) & MCWHORTER (F. P.). **A disease of Cabbage in western Oregon due to Cercosporella albomaculans.**—Abs. in *Phytopathology*, xxxiv, 10, p. 936, 1944.

The foliage of cabbage grown for seed in Coos and Curry Counties, Oregon, in 1943, was attacked by a *Cercosporella* producing black, dendritic lesions, becoming rounded or rectangular, with well-marked margins, and attaining a diameter of 10 to 20 mm. Wild turnips in the plantings were profusely infected by *C. albomaculans*, cross-inoculation experiments with which on cabbage and reciprocally gave positive results. The disease is uncommon on cabbage, to which it was probably transmitted through natural channels in the case under observation.

BLACKFORD (F. W.). **Black rot and black leg of Cabbage and Cauliflower.**—*Qd agric. J.*, lix, 5, pp. 287–289, 1 fig., 1944.

The disease of cabbage and cauliflower most frequently encountered in Queensland is black rot, due to *Pseudomonas* [*Xanthomonas*] *campestris* [*R.A.M.*, xxiii, p. 283], which is particularly severe in summer-grown cabbages. Both crops are also sometimes affected by blackleg (*Phoma lingam*) [ibid., xxii, p. 234]. Control depends, in the first place, on selecting seed-bed sites on land that has not previously grown cabbages, cauliflowers, or turnips, and is itself at some distance from areas that have produced these crops, or, at least, practising soil disinfection. Seed treatment is also necessary, 30 minutes' immersion in water at 122° F. sufficing to control both diseases. Any affected plants which may appear should be discarded at transplanting. After harvesting, all plant debris should be burnt; any diseased material unavoidably left unburned should be allowed to decompose by planting crucifers only once every three or four years.

KVÍCALA (B.). **Selective power in virus transmission exhibited by an aphis.**—*Nature, Lond.*, clv, 3928, pp. 174–175, 1945.

In the author's experiments, the aphids *Myzus persicae* and *Brevicoryne brassicae*, when colonized on cauliflower seedlings infected with both cabbage black ringspot [cabbage ring spot] virus and cauliflower mosaic virus, transmitted both, whereas *M. ornatus*, when similarly colonized, transmitted only the cauliflower mosaic virus.

CAMERON (A. E.). **Insect and other pests of 1943.**—*Trans. Highl. agric. Soc. Scotl.*, Fifth Ser., lvi, pp. 37–61, 9 figs., 1944.

During an abnormally heavy infestation of crucifers and potatoes in the Lothians in July, 1943, by *Myzus persicae*, neighbouring sugar beet and mangold crops developed virus yellows [*R.A.M.*, xxiii, p. 420], not hitherto recorded in Scotland, the diagnosis of R. Heddle, Advisory Botanist, East of Scotland College of Agriculture, being confirmed by Dr. R. Hull, Midland Agricultural College, Sutton Bonington. The disease was most severe (50 to 100 per cent.) in crops situated within the radius covered by the aphid, and was almost or entirely absent from non-infested districts. In the parts of England where virus yellows is prevalent, it is thought that the beet seed crop may serve as a reservoir of winter inoculum, but in Scotland, where beets are not raised from seed, another

source of infection must be sought, possibly in ground-keeper beets and stored mangolds.

SERENI (DEBORAH). **Sclerotinia minor on Lettuce and Beans.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 78–95, 1 pl., 1 fig., 1944.

In Palestine, *Sclerotinia minor* was first discovered in 1934; at Rehovoth it has been isolated by various workers from the roots of carnation and *Phlox*, from citrus seedlings, and from potato roots and stems, while the author has found it on broad beans, lettuce, cabbage, tomato, and clover. Affected lettuce has also been found in other parts of Palestine. On this host, the fungus appeared at the base of the leaves and progressed along the midrib. In late stages, the entire root-collar was involved, while in severe cases the leaves became water-soaked and the whole plant melted into a formless mass. Infection was very severe from January to February, 1934, some plants being destroyed in a few days. Broad beans were attacked when the plants had reached a height of 0·5 m., but had not formed pods. The leaves turned black from the tips, shrivelled, and withered, and the stem also became black, blackening and shrivelling starting at the root-collar and spreading upwards; even when the whole stem was affected, the plants, though dry and withered, remained upright.

Isolated from lettuce and beans, the black, irregular sclerotia measured 0·5 to 2 mm. long, and often anastomosed into irregular, flattened bodies several mm. long. Reproduction was purely vegetative. Sclerotia formed, and after a dormancy period germinated and produced mycelium. No apothecia were developed. In culture, microconidiophores measuring 10 to 15 by 4 to 5 μ were formed, bearing round conidia 3 to 4 μ in diameter.

The optimum and maximum growth temperatures were, respectively, 20 to 25° and 30° C. Good growth was obtained on acid and alkaline media, the optimum P_H being 6 to 6·6. During growth, the fungus secreted weak pectinase and a considerable amount of oxalic acid. Germination was more rapid in light than in dark conditions. Sclerotia from soil and diseased plants remained viable for over a year, and displayed strong resistance to dry heat, germinating after exposure to 80° for 30 minutes, 90° for 20 minutes, 100° for ten minutes, and 110° for five minutes. Artificial inoculations in the laboratory and field of lettuce, beans, and potato gave positive results, which also followed inoculations of unwounded fruits of oranges, Clementine mandarins, apples, pears, and bananas. The fungus appeared to be somewhat more susceptible to mercury compounds than to copper sulphate or sulphur.

OLIVE (L. S.) & WALKER (E. A.). **A severe leafspot of Soybean caused by Phyllosticta sojaecola.**—*Plant Dis. Reptr*, xxviii, 37, pp. 1122–1123, 1944. [Mimeographed.]

Soy-bean leaf spot (*Phyllosticta sojaecola*) [*Pleosphaerulina sojaecola*: *R.A.M.*, xviii, p. 292], reported in epidemic proportions in south-western Ontario in the summer of 1943, was found in July, 1944, in several soy-bean fields in Queen Annes and Kent Counties, Maryland. In New Jersey, the disease caused light to moderate infection during August, in two localities.

In Maryland, the fungus appears able to cause severe damage to soy-bean leaves. The spots, situated at the margins or towards the interior of the leaflets, range from 2 to several cm. in diameter. In more advanced infections, the greater part of a leaflet becomes covered with the larger spots. The spots have a dark purple, usually irregular border, surrounding a lighter, brownish inner zone, bearing numerous dark pycnidia. These exude conidia averaging about 8 by 3·2 μ and generally containing two conspicuous oil droplets. As the spot ages, the brownish tissue ruptures and falls out, leaving only the purple border.

BOOER (J. R.). **Control of white rot in Onions.**—*Nature, Lond.*, clv, 3930, pp. 241–242, 1945.

During 1943 and 1944, the author obtained promising results in the control of white rot (*Sclerotium cepivorum*) [*R.A.M.*, xxii, p. 422; xxiii, p. 512] on spring-sown James's keeping onions by applying 4 per cent. calomel [mercurous chloride] dust to the seed drill at sowing. For salad onions raised from March sowings, 1 lb. dust per 50 yds. of drill appeared to suffice, but for bulb onions grown from seed 1 lb. per 25 yds. gave better control.

DE FIGUEIREDO (E. R.) & PEREIRA (H. F.). **Uma doença grave da Berinjela causada por Phomopsis vexans.** [A serious Eggplant disease caused by *Phomopsis vexans*.]—*Biológico*, x, 11, pp. 349–352, 1 fig., 1944.

Phomopsis vexans, to which no previous reference could be found in Brazilian phytopathological literature, has been encountered in the eggplant crops along the coast of São Paulo, causing such devastating losses as to render control measures impracticable. Prophylactic methods to be adopted in future should include the planting of resistant varieties, e.g., Florida High Bush or Excelsior, in preference to the susceptible Beauty, and repeated applications of Bordeaux mixture to the growing plants.

A wilt disease of Sunn Hemp in S.A.—*Fmg S. Afr.*, xx, 226, p. 30, 1945.

A brief, preliminary account is given of a wilt of *Crotalaria juncea* due to *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [*R.A.M.*, xvii, p. 442], which occurs in several localities in South Africa, notably in the Transvaal and parts of the Cape, and appears to be spreading. Plants in all stages of growth develop rapid wilting and dying. In very young seedlings, the disease has the effect of damping-off, affected plants have a yellowish tinge, often accompanied by a silvery appearance, due to the leaves drooping and curling in so that the under side shows. Later, the leaves become stiff, brown-grey, and dry, dropping off from the base of the plant first. The entire plant may die within three or four days of the appearance of the first symptoms. Sometimes, longitudinal brown streaks may be present on the stems of affected plants, while on dead or dying plants a thick, salmon-pink fungal growth often appears near the base of the stem, extending upwards for several inches. This is the stage most easily recognizable in the field.

In a stand of sunn hemp the disease may at first appear in isolated patches, or it may affect only one or two plants here and there. Spread is uneven, but seems to follow the direction of the flow of rain water and irrigation water. Infection appears to be carried over in the soil. The control measures suggested are a fairly long rotation and the use of a fungicidal dust to protect the seedlings. The disease constitutes a menace to the successful use of the crop for green manuring and other purposes in many areas.

CHOWDHURY (S.). **Physiology of Cercospora sesami Zimm.**—*J. Indian hort. Soc.*, xxiii, 3, pp. 91–107, 1 pl., 5 figs., 3 graphs, 1944.

Leaf spot of sesame (*Sesamum indicum*), due to *Cercospora sesami* [*R.A.M.*, xxi, p. 427], is stated to have been prevalent for some years in the vicinity of Sylhet, Assam, where it causes considerable damage. The disease also occurs in other parts of Assam, and has been reported from Bombay.

As a rule, the plants are attacked just at or before flowering-time. Light brown spots, 2 to 5 mm. in diameter, appear on both surfaces of the leaves and sometimes coalesce into irregular areas, 5 to 15 mm. in diameter. The colour darkens as conidiophores and conidia form, and the surrounding leaf tissue frequently assumes

a yellowish hue. On the petiole the spots are elongated and of varying lengths, at first light brown, and gradually darkening. Generally, the stem is much less severely affected than the leaves, the spots resembling those on the petiole; sometimes the whole stem dries, and the plant droops. The pods show more or less circular, brown, later black lesions, 1 to 7 mm. in diameter. In advanced stages the pods are often destroyed.

Within the host, the mycelium consists of irregularly septate, thick-walled, light brown hyphae. The light brown conidiophores, which become dark brown when mature, are produced in clusters of 5 to 10, and emerge through the stomata. Generally unbranched, they measure 38·5 to 67·5 by 4 μ, and are mostly 0- to 3-septate. The subhyaline to very light yellowish conidia are 7- to 10-septate, elongated, and tapering towards the apex. They measure 88 to 136 by 3 to 4 μ.

Inoculation tests in the laboratory and the field showed that the fungus can attack every part of the host. Inoculation with mycelium induced infection within 48 hours, and with spores in four to six days.

When the fungus was grown on a large number of artificial media, growth was better on thickly- than on thinly-poured plates, and in alternate light and darkness than in complete darkness or continuous light. It tolerated relative humidities from 50 to 100 per cent., the optimum being 92 per cent. The optimum growth temperature lay between 25° and 30° C. The chief factors influencing zonation in culture were media, alternate light and darkness, and fluctuating temperatures, while sporulation was affected by light, humidity, temperature, media, and wounding. Conidial size and septation were affected by temperature, relative humidity, and media. Mean conidial length was greatest (109·5 μ) at 25° and least (79·5 μ) at 35°. Mean width decreased with rise of temperature, and mean septation was greatest (8) at 25° and least (5) at 35°. The mean length was 102·9 μ at relative humidity 47 per cent., 128·2 μ at 70·4 per cent., and 157·9 μ at 100 per cent., while the mean septations for the same humidities were 8·5, 10·5, and 13, respectively. As regards media, under otherwise identical conditions, the average length of the conidia was greatest (110·9 μ) on *Sesamum* stems, and least (101 μ) on Dox agar, while the average width was the same on Dox and oatmeal agars (3 μ) and slightly more (3·4 μ) on *Sesamum* stems. The optimum P_H concentration for growth was 6·5; no growth occurred at P_H 2·1 to 2·7 or at P_H 8·5.

SMITH (K. M.). **Plant viruses.**—*Endeavour*, iv, 13, pp. 22–28, 12 figs. (10 col.), 1945.

This popular paper on plant viruses is noteworthy for the excellent coloured figures showing the wide range of symptoms induced on tobacco, and in one instance on tomato, by various strains of the tobacco mosaic virus.

Report of the Director for the year ending 31 October, 1943.—*Bull. Conn. agric. Exp. Sta.* 477, pp. 52–56, 1 fig., 1944.

In this report [cf. *R.A.M.*, xvi, p. 21] it is stated that Dutch elm disease [*Ceratostomella ulmi*] is becoming more prevalent in south-western Connecticut, probably owing to the cessation of control work by the Federal authorities three years ago. Efforts are at present confined to preventing spread into the eastern half of the State. Protection can be afforded to valuable elms in urban areas by maintaining a disease-free zone round each locality where the trees are present. Recent work indicated that the probability of infection at a distance of 500 ft. from a diseased tree is 1 in 500, while at 1,000 ft. it is only 1 in 10,000.

A new fungicide, disodium ethylene bisdithiocarbamate, is stated to be water-soluble, but when it has dried after being sprayed on to the plant, to be invisible and water-insoluble. Laboratory tests with a synthesized form of juglone, a sub-

stance excreted by walnut roots, proved it to be more strongly fungicidal than copper oxide.

Experimental evidence showed that Bordeaux mixture reduced potato yields by about 25 per cent., the injury being masked by the control of flea-beetles [*Epitrix cucumeris*]. Search for a safer material is being continued, but in the meantime spray damage can be lessened by lowering the proportion of lime to half that of the copper sulphate and using dolomitic instead of hydrated lime.

BURBANO (J.) & RUIZ (C.). **Monografía agrícola de la Provincia de Imbabura.** [Agricultural monograph of the Province of Imbabura.]—*Bol. Dep. Agric. Ecuador* 26, 119 pp., 11 figs., 2 graphs, 1943.

The following information on plant diseases and their control in the Province of Imbabura, Ecuador, is presented by L. RODRIGUEZ in this monograph. Cereals in general are attacked by black and yellow rusts (*Puccinia graminis* and *P. glumarum*), while brown rust (*P. triticina*) is confined to wheat. *P. maydis* is ordinarily of little economic importance, but in cases of severe infection the rusted maize leaves should be collected and burnt. Wheat is subject to loose smut (*Ustilago tritici*) and bunt (*Tilletia tritici*) [*T. caries*]. Maize smut (*U. maydis*) [*U. zeae*] usually occurs only in a sporadic form, and may be combated by burning the galls from the diseased plants, which should on no account be used as fodder, since passage through the intestinal tract of livestock fails to destroy the viability of the spores.

Potato late and early blights (*Phytophthora infestans* and *Alternaria solani*) are controllable by preventive treatments with 1–1–100 Bordeaux mixture. The elimination of powdery scab (*Spongospora subterranea*) may be effected by eight to ten minutes' immersion of the seed in mercuric chloride (2 lb. 2 oz. in 1,000 l. water), followed by a cold-water rinse. Commercial formalin is also effective. Seed selection is the most efficacious method of eradicating wart disease (*Synchytrium endobioticum*) from the crop.

MOORE (W. C.). **Cereal diseases. Their recognition and control.**—*Bull. Minist. Agric., Lond.*, 129, 42 pp., 18 figs., 1945. 1*s.* net.

This bulletin gives an excellent semi-popular account of the cereal diseases found in Britain, a few diseases occurring abroad, but not yet recorded in this country, being included.

SPRAGUE (R.). **Rootrots of cereals and grasses in North Dakota.**—*Bull. N. Dak. agric. Exp. Sta.* 332, 35 pp., 8 figs., 1944.

In North Dakota, the root-rot diseases of cereals and grasses may be divided into four main types, viz., pre-emergence seed and seedling rots, damping-off, root-browning or seedling blight, and general root decay or necrosis.

The first is caused by *Pythium debaryanum*, *Helminthosporium sativum*, *Fusarium* species, and various generally weak parasites, such as *Rhizoctonia* [*Corticium*] *solani*, *Curvularia geniculata*, and *Phoma terrestris*. In grasses, pre-emergence rotting due to *Pythium arrhenomanes* [*R.A.M.*, xxi, p. 366] is serious in early autumn seedings, and in mid- to late spring in warm-season grasses or grains. Any of the general root-decay fungi except the weaker *Fusarium* species are capable of causing pre-emergence killing. The loss due to this seed-rotting in North Dakota is greatly under-estimated, and seldom amounts to under 25 per cent. in small grasses.

Damping-off soon after emergence is caused by *Pythium debaryanum* and related species; true damping-off is less common in grasses locally than in certain non-grass crops.

Root-browning or seedling blight, due to *Pythium arrhenomanes*, causes the

seedlings of cool-season grasses to wither and die about six weeks after the April seeding. Warm-season grasses, maize, sorghum, and particularly millet are also affected if seeded early, before the soil is thoroughly warm.

General root decay or necrosis, caused by *H. sativum*, *F. scirpi* var. *acuminatum*, *C. geniculata*, and, to some extent, by *P. debaryanum*, *P. irregulare*, and *P. ultimum*, is a slower process, generally known as 'common root rot'. Injury is not confined to any particular period of growth, though most of it occurs in summer as maturity approaches in cereals, or on grasses past the early seedling stages.

The most important fungal root parasite of grasses in North Dakota is *P. arrhenomanes*, while that of wheat is *H. sativum*. Both infect almost all cereals and grasses. Oats are moderately susceptible to most strains of *P. debaryanum*, *P. ultimum*, and *P. irregulare* causing root necrosis and damping-off, whereas wheat is resistant to nearly all of them. Small-seeded grasses are generally highly susceptible to them if seeded in cool, moist soil. Most of the *Fusarium* species found locally are important only as seed rots in the early season, but *F. graminearum* [*Gibberella zeae*] and *F. culmorum* are sometimes serious on the roots of cereals in the Fargo area. *Corticium solani* is prevalent on cereal and grass roots in wet weather, but most of the strains are not strongly parasitic to most grasses and cereals. It sometimes causes eye spot of wheat stem bases.

Pink root of maturing cereals and grasses is due principally to a non-parasitic development of *F. oxysporum* on dead roots, or to a non- or semi-parasitic infection by *Phoma terrestris*, which is abundantly present in mid- to late summer on cereals and grasses. It is not important, but sometimes rots the seeds of sorghum and maize in wet, retarded, early-season weather.

Several common moulds, such as *Alternaria* species, are non-parasitic on living cereals and grasses. *Curvularia geniculata* possesses strains which cause root decay in some cereals and grasses.

MACHACEK (J. E.). **The prevalence of Septoria on cereal seed in Canada.**—*Phytopathology*, xxxv, 1, pp. 51–53, 1 fig., 1945.

Septoria nodorum was isolated from a large number of the 6,183 samples of cereal seed-grain collected from all the provinces of Canada from 1939 to 1943, inclusive, the heaviest infection generally occurring in wheat and the lightest in oats, while barley was intermediate. To cite some data from the accompanying table, the mean percentages of infected seeds in the wheat samples from the Maritime Provinces in the five years of the survey were 1·35, 0·00, 17·84, 19·63, and 12·29, respectively, the corresponding figures for oats being 0·20, 0·00, 0·04, 0·03, and 0·05, respectively, and for barley 0·03, 0·25, 1·00, 0·12, and 0·55, respectively. In 1942 and 1943, however, barley from Saskatchewan and Alberta showed higher percentages of infection than wheat (1·88 and 2·34 in the former year and 5·02 and 3·96 in the latter compared with 1·16 and 1·40 and 1·27 and 0·94, respectively), suggesting the possibility of physiologic specialization within the fungus. Some support was lent to this hypothesis by cultural differences between the eastern and western strains, the pycnospores of the latter, for instance, being longer and thicker than those of the former.

HARRAR (J. G.), LOEGERING (W. Q.), & STAKMAN (E. C.). **Relation of physiologic races of Puccinia graminis tritici to Wheat improvement in southern Mexico.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1002, 1944.

Physiologic races 38, 59, and 19 of *Puccinia graminis tritici* were the only ones revealed by surveys during the past 12 years to be of practical importance in southern Mexico [*R.A.M.*, xix, pp. 10, 463], where races 56 and 17, very prevalent in the north of the country and the United States, are seldom encountered. Marquis, Rival, Newthatch, Regent, Renown, Pilot, and Mida are among the

North American varieties showing virtual freedom from *P. g. tritici* and high resistance to leaf rust [*P. triticina*] in two years' tests under epidemic conditions near Mexico City, but all were two to three weeks later in reaching maturity than certain early, highly susceptible varieties commonly grown in Mexico.

CARTWRIGHT (W. B.) & SHANDS (R. G.). **Wheat varieties resistant to the Hessian fly and their reactions to stem and leaf rusts.**—*Tech. Bull. U.S. Dep. Agric.* 877, 6 pp., 1944.

This is a report on the reactions to the Hessian fly [*Phytophaga destructor*] and stem and leaf rusts [*Puccinia graminis* and *P. triticina*: *R.A.M.*, xxii, p. 294] of certain wheat varieties, the tests with the insect being carried out at Lafayette, Indiana, from 1939 to 1943, and those with the rusts at Madison, Wisconsin, in 1941 and 1942. Spreader rows of susceptible varieties were inoculated with race 56 of *P. graminis* in the former year, and with 19 and 56 in the latter. Natural epidemics of *P. triticina* occurred in each year.

Most of the 92 common wheats were more or less susceptible to both rusts. Five selections from Portugal, Uruguay, and Argentina showed merely traces of leaf rust, and 15 others developed only 5 to 20 per cent. Marquillo and Portugal 90 seemed to be the most resistant to *P. graminis*. The three club wheats were susceptible to both rusts and the 21 durums all highly resistant, six showing only traces of *P. graminis*. Some of the durums combined resistance to the rusts with a similar reaction to the fly, and may therefore be specially useful in breeding programmes.

CORTAZAR SAGARMINAGA (R.). **Estudio de la herencia de la resistencia al Puccinia graminis tritici y otros caracteres en los cruzamientos de la variedades de Trigo Sinvalocho × Premier y Sinvalocho × Regent.** [Study of the inheritance of resistance to *Puccinia graminis tritici* and other characters in crosses of the Wheat varieties Sinvalocho × Premier and Sinvalocho × Regent.]—*Agric. tec. Chile*, iv, 1, pp. 88–97, 1 fig., 1 graph, 1944.

In connexion with a project of breeding wheat for resistance to *Puccinia graminis tritici* in Chile [*R.A.M.*, xxii, p. 424], the writer conducted trials at the Minnesota Agricultural Experiment Station, using a mixture of 20 physiologic races of the rust, to determine the mode of inheritance of this character in crosses of Sinvalocho × Premier and Sinvalocho × Regent.

In the latter cross resistance was found to depend on three complementary factors, which are probably also operative in the former, though in this case the aberrant behaviour of two out of the 14 F_2 families raises a doubt as to the correctness of the hypothesis. In Premier × Sinvalocho the characters of date of earing and number of panicles are inherited independently of each other and of reaction to rust, but in Regent × Sinvalocho linkage was observed between resistance to *P. g. tritici* and awn type.

VALLEGA (J.). **Reacción de algunos Trigos con respecto a los razas fisiológicas de Puccinia rubigo-vera tritici, comunes en Argentina.** [Reaction of certain Wheats with regard to the physiologic races of *Puccinia rubigo-vera tritici* prevalent in Argentina.]—*Rev. Fac. Agron., B. Aires*, xi, 1, pp. 91–115, 1 diag., 1944. [English summary.]

None of the wheat varieties cultivated in Argentina is completely resistant to all the physiologic races of *Puccinia rubigo-vera tritici* [*P. triticina*] occurring in the country [*R.A.M.*, xxi, pp. 187, 518], but Sinvalocho sustains the least damage on account of its strong capacity to withstand attack by the predominant races, 20 and 49. The Previsión 25, Klein 157, Acero, Klein 33, Otto Wulff, and Pampa varieties, which are resistant or only moderately susceptible to most races, do not usually suffer severe injury, but their reactions to race 20 being very variable,

they may, under certain conditions, be heavily infected. The following varieties are resistant to individual races: I.F.L.E. 7d to 20, 49, 5, 57, and 114; Lin Calel to 5, 57, and 114; and Favorito to 62.

Among the old varieties and selections grown in the country, Titan is of special interest as practically immune from all races; Renacimiento and Barleta 10 are attacked only by 62 and 5, respectively; Apulia (Klein's selection) is very resistant to 20, 49, 62, and 5; while some others, including Ardito (Klein), Barleta 25c, Klein 49 and 75, Progreso, Riccio, Sin Rival, and Vencedor, are resistant to the most prevalent races. A new selection, Progreso × Apulia H211 t 140 proved to be resistant to all races of the rust existing in Argentina, and similar observations were made in connexion with lines developed from H3 × 38 M.A., except for the variable reactions of the latter to race 5. Of the foreign varieties tested, Warden × Hybrid English w 325, Bobin Gaza Bobin, Colorado barbudo [bearded], Corazón [Heart] de Maria, Democrat, H. 1053, Kawvale, Mediterranean, Persia, Axminster, Normandie, and Thew were resistant to one race or more, whereas some North American wheats, such as Mercury, Coronation, Renown, and Hope gave an intermediate response to nearly all the races.

An analysis of different species of *Triticum* showed that all forms belonging to *T. monococcum* and *T. timopheevi* are resistant to brown rust, whereas *T. spelta*, *T. macha*, *T. sphaerococcum*, *T. durum*, *T. diococcum*, *T. turgidum*, *T. polonicum*, *T. persicum*, and *T. pyramidale* comprised forms with quite divergent reactions.

JAMALAINEN (E. A.). **Über die Steinbrandanfälligkeit verschiedener Weizensorten in Finland.** [On the susceptibility to bunt of different Wheat varieties in Finland.]—*Julk. Valt. Maatalousk.* 115, 27 pp., 1941. [Abs. in *Z. PflKrankh.*, liv, 1–2, pp. 46–47, 1945.]

Wheat bunt is stated to be still fairly prevalent in Finland, where 97 per cent. of the infection is caused by *Tilletia tritici* [*T. caries*] and 3 per cent. by *T. levis* [*T. foetida*: *R.A.M.*, xxiii, p. 338]. All the summer and winter varieties at present under cultivation are more or less susceptible. Of the former group, Diamond and Garnet are heavily infected at a low temperature (8° to 10° C.), but sustain very little damage at a higher range (17° to 19°); hence probably the larger crop reductions in the north than in the south. The divergences in pathogenicity of bunt collections from various localities point to the existence in the country of different physiologic races.

MUNDKUR (B. B.). **Some rare and new smuts from India.**—*Indian J. agric. Sci.*, xiv, 1, pp. 49–52, 2 figs., 1944.

This descriptive list of 19 species of smuts not before recorded in India, of which seven are proposed as new species and one as a new combination, includes the following items of special interest. *Tilletia caries* and *T. foetida* were found in wheat ovaries at New Delhi, in April, 1941, apparently the first authentic records of these fungi in the Indian plains. The seed from which the crops were raised appears to have come from Baluchistan and to have been infected. Both species have been recorded for Sind, but their occurrence there is doubtful. *Neovossia indica* [ibid., xxiii, p. 338] was found in wheat seed at New Delhi and in the United Provinces in 1942 and in Sind in 1941.

Ustilago tritici was found on wheat leaves in the Central Provinces in January, 1943; this is the first record of the smut for central India.

BRIGGS (F. N.). **Linkage relations of factors for resistance to mildew in Barley.**—*Genetics*, xxx, 2, pp. 115–118, 1945.

A study at the University of California of the progeny of a cross between Psaknon barley (*Erysiphe graminis*) carrying the Psaknon factor Ml_p for resistance to mildew

[*R.A.M.*, xxii, p. 200], and Selection 175 (Duplex×Atlas), carrying the Duplex factor ml_d for resistance to the disease, showed that these two genes for resistance were linked with a recombination value of 16·38 per cent. They were further found to be linked with the factor pair, normal versus albino (*At at*) which places them in linkage group II, the cross-over percentages for the Duplex and Psaknon genes being 12·08 and 36·65, respectively. The gene order indicated is *at*, ml_d, Ml_p.

McLaughlin (J. H.). **Southern Cooperative Corn Disease Research Committee Report for 1944.**—*Plant Dis. Reptr, Suppl.* 153, pp. 18–29, 6 figs., 1945. [Mimeographed.]

In 14 tests conducted in South Carolina, Georgia, and Oklahoma in 1944, the emergence of maize seed heavily infected by *Fusarium moniliforme* [*Gibberella fujikuroi*] and to a lesser extent by *Rhizopus* and *Penicillium* spp. was significantly improved by treatment with semesan jr., spergon, barbak C, and Dubay 1452–F at a dosage of 1½ oz. per bush., the mean increases obtained with which at all locations amounted to 5·21, 5·51, 5·95, and 5·17 per cent., respectively, over the controls. In eight of the trials highly significant stand increases resulted from the use of any one of the above-mentioned four chemicals. Late as well as early plantings benefited from seed treatment. In general, no appreciable differences in emergence resulted from variations in the prescribed rates of application of the fungicides.

Brichet (J.). **Une maladie redoutable qui se répand dans nos Orangeries. La 'psorose' (scaly-bark) des Américains.** [A serious disease that is spreading in our Orange groves. 'Psorosis' (scaly-bark) of the Americans.]—*Fruits & Primeurs*, xiv, 153, pp. 228–230, 1944.

In 1930, the author observed some hundreds of Thomson's Navel orange trees in an orchard at Arba, Algeria, affected by psorosis [*R.A.M.*, xxiv, pp. 56, 98]. Since then, the disease has been noticed in numerous plantations in Algeria. The author has never found young branches to be attacked. The condition is most prevalent in the relatively moist coastal districts, and is much rarer in the hot, dry plains; the most vigorous trees appear to be as susceptible as the weakest. Sweet orange varieties (*Citrus sinensis*), including Washington's Navel, Thomson's Navel, and the Valencia late orange, are the most susceptible, but no infection has so far been observed on the Mediterranean varieties at present grown in north Africa, i.e., Portuguese, ordinary Valencia, Maltese, and local varieties derived from these. Mandarin orange and pomelo are resistant but *C. bigaradia* and rough lemon are susceptible.

The spread of the disease, which appears to be advancing with increasing rapidity, is attributed to the planting of susceptible American varieties, large-scale budding from affected trees, and careless methods of pruning. The paper concludes with an outline of the usual control methods.

Bliss (D. E.). **Controlling Armillaria root rot in Citrus.**—7 pp., 8 figs., California Agricultural Experiment Station, 1944. [Mimeoprint.]

In controlling citrus root rot due to *Armillaria mellea* [*R.A.M.*, xxiii, p. 296], which at present is causing widespread concern in southern California, all trees in and about the orchard should be examined once a year. Growers should know the history of their land, and the position of former washes, creeks, and native trees, all of which are potential sources of infection. Dead stumps should be regarded with suspicion, as should areas where the trees are sickly or have died. Windbreaks, roadside trees, and ornamentals are all liable to infection, the disease spreading rapidly through the roots of such plants when the tops are removed. A good map should be made to assist in the survey, large enough to show the position of every tree. Individual blocks, rows, and trees should be numbered, and the

disease situation indicated in detail by symbols. The map can be altered as required, or a new one made for each survey.

After the visibly affected trees have been located, the outer limits of the infestation must be determined. The crown roots of all apparently healthy trees adjacent to infected trees should be examined. If the fungus has not reached the trunk, a shallow test trench should be made midway between the two trees at right angles to a line joining them. The condition of the roots in this trench will indicate roughly how far the disease has spread and whether the apparently healthy tree can be protected. The roots of other apparently healthy trees about the edge of the affected area should be similarly inspected.

When all this preliminary information has been plotted on the map, one or more centres of infection may be found. A continuous trench should then be dug round each infected area, 4 to 5 ft. deep and wide enough for a man to work in. The trench area should include all affected and suspected trees. As an extra precaution, a whole row of healthy or apparently healthy trees may be left between the trench and the infected area. The trench should run half-way between the tree trunks, and all the earth dug up should be thrown towards the infected area.

When citrus orchards are being planted, the most practical means of control is to plant healthy nursery stock in uninfected soil. As tree roots of all kinds appear to become more susceptible to infection after removal of the tree tops, it is safer to retain a living infected tree in or near an orchard than to cut away the top without destroying the roots. The sporophores should be destroyed before the spores are discharged. Flood water should not be allowed to pass through the orchard. Trees on the banks of streams are liable to become infected through piles of trash in the bed, and willows and poplars planted along streams against soil erosion are also very susceptible.

To prevent further spread from an infected area, the continuous trench made round it should be converted into a chemical barrier. Carbon disulphide should be placed in a single line of charges along the bottom at the rate of 2 liquid oz. every 18 in. in holes 8 in. deep. The soil over each charge should be tamped at once, to prevent the escape of fumes. The trench should then be filled with the excavated soil, which should be compacted by tamping, but not watered. Carbon disulphide should then be applied in a single line of charges along the top of the filled trench at the same rate as in the trench. The soil over each charge should be tamped immediately, while that over the trench and to a distance of 2 ft. on both sides should be moistened with water to a depth of 3 in. Later, at intervals of six months, preferably when the soil is dry, carbon disulphide should be applied as before in a single line of charges along the chemical trench. The line of chemical treatment should coincide with the middle of the trench and should be accurately marked on the map.

To treat the disease, a pit may be dug about the root crown of each infected tree and left open indefinitely. Surgery may be resorted to in the early stages, the wounds painted, and the diseased wood destroyed.

To eradicate the fungus from affected soil, the affected trees should be pulled out with as many roots as possible, all roots over 2 in. in diameter being removed. The soil should be levelled, smoothed down, and left to dry. Carbon disulphide should then be applied over the whole area of the tree square or to the skirts of the adjoining trees at the rate of 2 liquid oz. per charge every 18 in. in rows 18 in. apart, in a triangular or diamond-shaped pattern. In sandy soil the charges should be 8 in. deep, and in a clay loam 6 in. Four charges should be applied about the place where the diseased tree stood, at 6 liquid oz. per charge, 4 ft. apart, and 4 to 6 ft. deep. The soil should be tamped over each charge and the soil over the whole treated area should be moistened with water to a depth of 3 in., this blanket of wet soil being maintained for three weeks. The surface should be raked if cracking

appears. A large canvas or glue-coated paper may be substituted for the water seal. The soil should then be allowed to dry, or the cover removed, and replanting carried out when all odour of the gas has disappeared.

MARCHIONATTO (J. B.). **La podredumbre de la raicilla del Naranjo.** [Orange rootlet rot.]—[*Publ.*] *Minist. Agric. B. Aires*, Ser. A, i, 1, 15 pp., 5 figs., 1945. [English summary.]

The literature on orange rootlet rot in Argentina [*R.A.M.*, xxiv, p. 98] is briefly summarized and discussed. The conclusion now reached is that the disease is due to infestation by the nematode, *Tylenchulus semipenetrans*, of trees grafted on sour orange stocks in infertile soils. At the moment the most hopeful prospect of control lies in the use of more compatible stocks, such as sweet lime or rough lemon, and the enrichment of the soil with nitrogen-, phosphorus-, and calcium-containing fertilizers.

WEBER (G. F.). **The blight disease of Cycas revoluta.**—*Proc. Fla Acad. Sci.*, vii, 2–3, pp. 129–132, 1 pl., 1944.

The first symptoms of the so-called 'blight' of *Cycas revoluta*, which has been under observation for over a decade in Florida, are pale green, sunken, rather shrivelled, rapidly expanding marginal areas, with the centres on the pinnae of the young leaves. The tissues along the outer margin shrink, and the pinnae are frequently curled or bent out of their characteristic flat plane, ultimately dying back to half or three-quarters of their length, or almost as far as the leaf rachis. These extreme features are not observed when the leaves are fully expanded before the onset of the disease, in which case the lesions often develop a brown or reddish-brown border and do not spread to any extent. Among the fungi isolated from blighted palms during the course of the studies were species of *Botrytis*, *Cladosporium*, *Alternaria*, *Diaporthe*, *Helminthosporium*, *Fusarium*, *Glomerella*, *Phoma*, *Macrophoma*, and *Pestalozzia*, most of which were inoculated into *Cycas revoluta* with negative results. The blight, which is most destructive in the Gainesville district in May and June, seems to be systemic and perennial, increasing annually in severity until the host dies. Diseased plants have not been observed to recover or produce a healthy whorl of leaves. Eradication of blighted plants as soon as the condition becomes apparent is the only control measure that can be suggested at present.

DASTUR (R. H.) & SINGH (M.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. X. The interrelation of sowing-date, nitrogen, water-supply, and spacing on growth and yield of 4–F Cotton.**—*Indian J. agric. Sci.*, xiv, 1, pp. 18–29, 1944.

Further studies on the factors affecting the incidence of 'tirak' in American cottons in the Punjab [*R.A.M.*, xxiii, p. 484] demonstrated that when cotton was sown on 12th May, 2nd June, and 22nd June, 1939, there was a steady increase in setting percentage and in the boll weight with delay in sowing. These tendencies raised the yield status of later sowings under unmanured conditions.

The dominating effect of nitrogen on growth, amelioration of 'tirak', and improvement of yield was clearly established. The beneficial effects of nitrogen on the dry weight, weight of seed cotton per boll, and on yield diminished as sowing was deferred. Increase in boll number with nitrogen application was less marked in the third sowing than in the first two.

The evidence indicated that in the first two sowings it made no difference whether the plants were widely or closely spaced, but that in the final sowing close spacing was essential in order to counteract the depression in boll number. The response to water was low and did not interact with any other factor.

[A popular account of this work appears in *Indian Fmg*, v, 6, pp. 254–258, 1944.]

PRASAD (N.). **Studies on the root rot of Cotton in Sind, 1.**—*Indian J. agric. Sci.*, xiv, 1, pp. 40–43, 1944.

Investigations carried out in Sind into cotton root rot, which occurs every year in the province and causes considerable damage to the crop, infection generally ranging from 5 to 10, but sometimes reaching 60 per cent., showed that the first visible symptom is a complete wilting of the plant. The affected cotton can easily be pulled out of the soil, nearly all the lateral roots being destroyed. When the roots are squeezed, a yellow liquid oozes out. The cortical tissues of the root become fibrous, and the central woody portion turns brown or, in severe cases, black. In Gujerat, the disease appears after the flowers have formed, while in the Punjab it occurs when the plants are two months old. In Sind, however, it attacks plants only 15 days old, and continues up to the boll formation stage.

Over 700 isolations were made from affected material from different places. Saprophytes were disregarded, and the rest of the isolates (*Fusarium* and *Rhizoctonia*) were arranged in seven different groups, based on kind of aerial mycelium (whitish, pinkish, scanty, &c.), discoloration of the medium (light brown, dark brown, &c.), and spore-bearing structures (none, sclerotia abundant, and sclerotia not abundant). Inoculum of the seven types was prepared by growing the fungi in Erlenmeyer flasks on a sterilized mixture of 190 gm. soil and 10 gm. wheat flour. To every 200 gm. of mixture 60 c.c. of water was added. Three weeks later, 12 in. pots were two-thirds filled with sterilized soil, half the contents of each flask were sprinkled over the soil, and six cotton seeds were placed on the inoculum. The seeds were then covered with the rest of the inoculum, which in turn was covered with sterilized soil. Four pots were used for each type. In the controls, the seeds were sown between two layers of sterilized soil and wheat flour.

Twenty days after sowing, wilt developed in the pots inoculated with type 3 (*Rhizoctonia*). In about a week nearly all the plants in this series died. Two days after the first wilting appeared, plants began to die in the pots inoculated with types 1 (*Fusarium*) and 5 (*Rhizoctonia*). Isolations from the affected plants in all cases gave fungi identical with those with which they had been inoculated. This experiment demonstrates that a type of *Fusarium* and two types of *Rhizoctonia* are capable of causing a disease in cotton similar to root rot as seen in nature. It also showed that the parasitic isolates were those which appeared most frequently when the isolations were made. Isolate type 1 caused 24 per cent. rotting, type 3 31·8 per cent., and type 5 16·7 per cent. The symptoms produced by *Fusarium* and *Rhizoctonia* resembled each other in all essential characteristics. The chief difference was that the discoloration produced by *Rhizoctonia* was very much darker than that due to *Fusarium*.

A second experiment showed that the *Fusarium* (type 1) and the *Rhizoctonia* (type 3) were more strongly parasitic together than singly. Together, they induced infection much earlier than singly, and the number of plants attacked was much greater. The percentages of rotting caused by the *Fusarium* alone, $\frac{1}{4}$ *Fusarium*+$\frac{3}{4}$ *Rhizoctonia*, $\frac{1}{2}$ *Fusarium*+$\frac{1}{2}$ *Rhizoctonia*, $\frac{3}{4}$ *Fusarium*+$\frac{1}{4}$ *Rhizoctonia*, and *Rhizoctonia* alone were, respectively, 19, 27·3, 80, 26·3, and 26. The symptoms produced by *Rhizoctonia* and *Fusarium* combined closely resembled those due to *Rhizoctonia* alone. Root discoloration was much more intense, and the colour varied from dark brown to black, being deepest at the collar.

Isolates 3 and 5 were tentatively identified as *R. bataticola* [*Macrophomina phaseoli*], while isolate 1 was referred to *F. caeruleum* [though the reported presence of masses of microconidia does not fit this species]. During the investigation, *R.* [*Corticium*] *solani*, the cause of cotton root rot in the Punjab, was not isolated. The present work confirms the view that *M. phaseoli* is the chief agent of cotton root rot in India and also shows that the *F.* sp. is an important cause of the disease in Sind.

BREMER (H.). **Keimlingskrankheiten der Baumwolle in Südwest-Anatolien.** [Seedling diseases of Cotton in south-west Anatolia.]—*Istanbul. Schr.* 4, 25 pp., 3 figs., 1943. [Received February, 1945.]

Following up Forsteneichner's studies on cotton seedling diseases in the Adana region of Turkey in 1929 [*R.A.M.*, x, p. 788], the writer extended similar investigations to eleven other centres of cultivation in different parts of western Anatolia.

From preliminary data it appeared very probable that parasitic agents do not play a decisive part in the development of cotton seedling diseases, which are primarily due to weakness incidental to adverse environmental conditions. In a series of experiments designed to verify this hypothesis, Bornova seed was sown in tin flats on six dates from January to July in 1939 at mean temperatures of 16°, 17°, 19°, 22°, 24°, and 32° C., respectively. Half the flats were sterilized with formalin, filled with sterilized soil, and watered with boiled water, and half the seed was dusted with ceresan (400 gm. per 100 kg.); in half the containers the soil was maintained in a moderately moist condition (50 per cent. of the water-holding capacity, and in the remainder in an extremely humid state (75 or up to 80 per cent.). Except at the minimum and approaching the maximum temperature, seed treatment with ceresan noticeably increased germination, especially in unsterilized soil: in the former case the deleterious effects of cold were too powerful to be counteracted by the precaution, and in the latter, the already high germinative capacity of the seed rendered further treatment superfluous. In sterilized soil the increase in germination was already apparent at 19°, whereas in untreated no comparable effect was observed until a temperature of 24° was reached. Evidently, dusting with ceresan not only eliminates the organisms actually adhering to the seed, but also acts as a local soil disinfectant. In connexion with these tests, it is worthy of note that ceresan treatment somewhat retarded cotyledonary development; there were, however, no permanent ill effects.

Further support was lent to the view that the fungal infection of cotton is secondary to injury of physiological origin by the microscopic detection of a diffuse brown discoloration, extending from the hypocotyl-root borderline more or less all over the underground system and obviously of external origin, since the inner layers were sound until saprophytic or facultative parasites gained ingress through the damaged tissues. Predominant among the invaders were *Rhizoctonia* sp. and bacteria, of which the former was usually associated with sharply delineated, sunken, constricted lesions and the latter with generalized decay. In most cases, however, both agents were present and the symptom-complexes frequently overlapped. *Rhizopus*, *Fusarium*, and *Alternaria* spp. were of less frequent occurrence and presumably of minor importance in the etiology of seedling rots.

In greenhouse and field seed treatment trials in 1938 and 1939 the relative value of ceresan solution and dust, Gassner's copper sulphate-ammonia solution, delinting with concentrated sulphuric acid, and dusting with caustic lime was compared. Ceresan gave the best results in the field, but it failed to counteract the damage inflicted by a dry spell in 1939, and even in plots where germination was powerfully stimulated the treatment did not prove to be economically advantageous.

MORQUER (R.) & NYSTERAKIS (F.). **Le Fusarium lateritium, champignon parasite du Phylloxera vitifoliae.** [*Fusarium lateritium*, a fungus parasitic on *Phylloxera vitifoliae*.]—*C.R. Soc. Biol., Paris*, cxxxviii, 3–4, pp. 75–76, 1944.

In July, 1940, the writers observed on the galls on leaves of Riparia vines at the Toulouse Agricultural Institute dead individuals of *Phylloxera vitifoliae* from which they isolated in pure culture a fungus with hyphae ranging from 2·5 to 7 μ, average 3 to 4·5 μ, in diameter, fusiform, arcuate, uniseptate microconidia, and predominantly tri- to quinqueseptate, falciform macroconidia, 27 to 48 by 3 to 5 μ. These

characters agree with those of *Fusarium lateritium*. Since the fungus was present on the vine foliage even during intervals between *Phylloxera* invasions, the vine would appear to serve as a natural substratum for the saprophytic phase of the fungus, which becomes parasitic with the advent of the zoocecidia. When an aqueous suspension of *F. lateritium* was sprayed on the infested leaves, a mortality of 40 per cent. of the larvae and adults resulted, while the figure attained in the natural epidemic was 60 per cent.

SCHWARTING (A. E.) & HINER (L. D.). **A study of domestic ergot of Wheat and Rye.**—*J. Amer. pharm. Ass.*, Sci. Ed., xxxiv, 1, pp. 11–16, 6 figs., 1945.

The following conclusions were reached on the basis of data collected from a systematic investigation of ergot (*Claviceps purpurea*) on samples from rye and wheat in South Dakota, Minnesota, and Ohio from 1940 to 1943 [cf. *R.A.M.*, xxiii, p. 132]. Structural variations between the ergots of the two crops are limited to compactness of the pseudoparenchyma. Ergot of rye is more deeply fissured than that of wheat. Chemical assay methods indicate that the indigenous products compare favourably with Spanish and Russian samples, the rye ergot being slightly higher in alkaloidal content and exhibiting a stronger potency than that of wheat. The native ergots were also shown by biological assay methods to meet official standards. The prevalent climatic conditions of central Ohio are conducive to natural infection of rye, wheat, and other grasses, but artificial inoculation in the field was found to increase the incidence of attack on rye and the yield of ergot. The practical utility of this method, however, can only be determined by large-scale operations over a protracted period with appropriate controls.

MCGILLIVRAY (W. A.) & METCALF (W. S.). **The chemical assay of the alkaloids of ergot. I. Total alkaloids in single sclerotia and bulk samples. II. A micro-method for estimation of ergometrine in a mixture of ergometrine and ergotoxine. III. The nature of the colour reaction with *p*-dimethylamino benzaldehyde.**—*N.Z. J. Sci. Tech.*, B, xxv, 3, pp. 115–128, 5 graphs, 1943.

A rapid and accurate method for the estimation of total alkaloids in single sclerotia and bulk samples of New Zealand ergot [*Claviceps purpurea*: *R.A.M.*, xxiv, p. 57] is described. The alkaloids are extracted by cold ammoniacal acetone, transferred to aqueous solution, and measured colorimetrically with the aid of a photo-electric absorptiometer. A method is also given for the estimation of ergometrine and ergotoxine in the absence of comparable amounts of other ergot alkaloids in single sclerotia and bulk samples of ergot.

MUSKETT (A. E.) & COLHOUN (J.). **Foot rot (Phoma sp.) of Flax.**—*Nature, Lond.*, clv, 3934, pp. 367–368, 1 fig., 1945.

Of recent years evidence has accumulated that the flax foot rot pathogen (*Phoma* sp.), first recorded in Ireland by Pethybridge *et al.* in 1921 [*R.A.M.*, i, p. 175] and responsible for an epidemic outbreak in Northern Ireland, Scotland, and Wales in 1944, is seed-borne, and to test the possibility of its control by seed disinfection, numerous laboratory experiments were carried out by the method already described in connexion with *Colletotrichum linicola* and *Polyspora lini* [ibid., xxii, p. 358] with the following results. Nomersan, so effective against the two last-named fungi [ibid., xx, p. 535], was less satisfactory in the *Phoma* trials, giving about 50 per cent. control when used at the rate of 12 oz. per cent. seed. The short wet process, using an 8 per cent. solution of ceresan U. 564 (0·9 gal. per cwt.), though superior to nomersan, was still not altogether efficacious, but arasan and new improved ceresan appear to be very promising for the object in view, the former reducing the incidence of infection from 32·6 to 10·8 and 14·5 per cent. at dosages of 12 and 9 oz. per cwt., respectively, while the comparable figures for the

latter were 2 and 5·5 per cent., respectively. New improved ceresan seems to be more directly toxic to the fungus than arasan, which exerts an inhibitory action on its growth necessitating the prolongation of the tests from seven to twelve days.

SCHUSTER (M. L.) & ANDERSON (E. J.). **Seedling blight and root rot of Flax in Washington.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1011, 1944.

Seed-coat injury from threshing and infection by soil-borne fungi resulted in poor flax stands in Washington, the incidence of damaged seed in the samples examined ranging from 10 to 15 per cent. in Zenith and Redwing to 65 to 75 in Viking and Bison. In greenhouse tests, hand-threshed seed produced better stands than that threshed by machine at medium-cylinder speed, while the use of high-cylinder speed for the operation caused the heaviest losses. *Fusarium oxysporum* was the fungus most frequently isolated from the diseased material, and inoculation experiments showed it to be a virulent pathogen and the principal agent of reduction in the flax crops of the State, some of the decrease, however, being attributable to saprophytes, such as *Alternaria* and *Penicillium*. Seed treatment with spergon, new improved ceresan, Dubay 1205 FF (50 per cent. tetramethyl thiuramdisulphide), and semesan conferred efficient protection against fungal damage, especially in the case of machine-threshed seed, in greenhouse experiments, and the first three also in the field.

LAURIE (A.) & RIES (V. H.). **Floriculture. Fundamentals and practices.**—vi+496 pp., 35 figs., 31 diags., 1 col. map, New York & London, McGraw Hill Book Co. Inc., 1942. $4.00. [Received March, 1945.]

Included in this useful manual on the theoretical and practical aspects of the cultivation of ornamentals are numerous items of phytopathological interest, including a tabulated section on pests and diseases and their control.

MARCHIONATTO (J. B.). **Enfermedades del Gladiolo y del Tulipan.** [*Gladiolus* and Tulip diseases.]—*Suelo argent.*, iv, 37, pp. 51–61, 1 fig., 1945.

Descriptive notes, with recommendations for control, are given on two diseases of *Gladiolus*, viz., scab, stem rot, or neck rot (*Bacterium marginatum*) and hard rot (*Septoria gladioli*) [*R.A.M.*, xxii, p. 154], and on tulip blight (*Botrytis tulipae*), all present and the two first-named troublesome in Argentina.

JONES (L. K.). **Mosaic, streak, and yellows of Carnation.**—*Phytopathology*, xxxv, 1, pp. 37–46, 1 fig., 1945.

Creager's substitution of the name 'mosaic' [*R.A.M.*, xxiii, p. 19] for that of 'yellows' as a designation of the carnation disease originally described by Peltier (*Proc. Amer. Carnation Soc.*, xxv, pp. 29–35, 1916) is considered to be misleading, since it is apparent from the description and figures in the first-mentioned paper that both workers were studying the same condition.

Carnation viruses have been under observation in Washington since 1930, and in 1937 they were made the object of intensive investigations, which have shown that two viruses, mosaic and streak, are combined in the yellows disease. The former is expressed by foliar mottling with pale and dark green areas and slight breaking in the flowers of coloured varieties; though generally present in commercial sorts, it is of little economic importance. Streak is characterized by yellowish to reddish streaks and spots on the leaves, sometimes causing the death of portions of the plants. It does not occur alone in commercial culture, but combines with mosaic to produce the virulent complex known as yellows, which has been very injurious to many varieties.

The mosaic virus is readily transmissible by mechanical inoculation but not by *Myzus persicae* or *Thrips tabaci*, has a minimum incubation period of 22 days, and

is inactivated by exposure to a temperature of near 60° C. and after 42 days *in vitro*. Streak is communicable by *M. persicae* but not by *T. tabaci* or mechanical inoculation, and its minimum incubation period is 25 days.

During the period 1941–4 a number of standard carnation varieties, namely, Betty Lou, Camelia, Chief Kokomo, Gardenia, Giant Laddie, Melrose, Patrician, Puritan, and Purity, were discarded from commercial greenhouses largely owing to reduction of quality and yield through yellows. Two varieties showing a high degree of resistance over the same period were John Briry and Matchless. Seedling plants raised from seed of English and French origin in 1938–9 and crossed with commercial Washington varieties from 1938–40 gave rise to 1,038 seedlings, none of which gave any indication of infection by mosaic or streak. In inoculation experiments by grafting on clones from 25 of the most promising seedlings, there were no cases of immunity but considerable differences in the extent of the damage were noted on the affected plants. Two semi-resistant, dark rose-pink varieties, named Victoria and Genevieve, have been developed from this material and are under observation in commercial greenhouses.

Environmental conditions play an important part in the manifestation of yellows symptoms, which may be intensified by factors tending to check plant growth, such as excess watering, nutritional deficiencies, and a superabundance of salt in the soil. Aphid control is the most effective method of reducing losses from yellows. Stringent selection of sound planting stock should be practised from the time the cuttings are removed from the sand until benching.

WALSH (T.). **Susceptibility of grasses to manganese deficiency.**—*Nature, Lond.*, clv, 3936, pp. 429–430, 1945.

After pointing out that hitherto it has been generally considered that grass is much less susceptible to manganese deficiency than oats and certain other crops, the author describes experiments which showed that different grasses react differently to manganese deficiency, that this effect applies to different strains of at least one grass, and that, depending on the species and strain (e.g., perennial and Italian rye grass [*Lolium perenne* and *L. multiflorum*] and cocksfoot [*Dactylis glomerata*], some grasses are almost as sensitive to manganese deficiency as the more sensitive oat and wheat varieties, and much more so than the least sensitive of these.

KEIL (H. L.). **New fungicide developments for turf.**—*Greenk. Reptr*, xii, 6, pp. 5–6, 1944.

During the past two years a number of new organic compounds showing promise in laboratory trials were tested in the field at the Rhode Island Agricultural Experiment Station for their value in the control of dollar spot (*Sclerotinia homoeocarpa*) and large brown patch (*Corticium vagum* = *Rhizoctonia solani*) [*C. solani*] on creeping bent grass [*Agrostis stolonifera*: *R.A.M.*, xxiii, p. 111]. In 1944, ten applications were made between 1st June and 31st August at ten-day intervals. By 21st August the incidence of the two diseases amounted to 39 per cent. and by 26th September to 55. Calo-clor (2 : 1 mercurous chloride and mercuric chloride) [ibid., xxiii, p. 491], 10 gals. per 1,000 sq. ft., was a very effective fungicide but caused considerable injury to the turf—at least 25 per cent. by 21st August. Isothan DL (dimethyl dilauryl ammonium chloride), 1·20 gals., also gave a very high degree of control and was less detrimental to the grass than calo-clor, while outstandingly good results without deleterious effects were achieved in the plots treated at the same rate with puratized N5D (phenyl mercuric triethanol ammonium lactate) [ibid., xxiv, p. 138].

BURTON (G. W.). **A technic for measuring ergot resistance in Paspalum species.**—*J. Amer. Soc. Agron.*, xxxvii, 2, pp. 160–162, 1945.

Dallis grass (*Paspalum dilatatum*), which is extensively used in improved pastures in the south-eastern United States, is highly susceptible to ergot (*Claviceps paspali*) [*R.A.M.*, xxi, p. 22], and little progress has hitherto been made in the development of resistant selections owing to the lack of a satisfactory technique for measuring differences in the incidence of infection in individual strains of the host. The following method has now been devised and applied at the Georgia Coastal Plain Experiment Station to the analysis of ergot content in over 1,000 seed lots of *P. dilatatum*. When dry enough, each lot was threshed, screened, and placed in a labelled coin envelope. From each sample 100 heavy florets were taken and placed in 16-mm. test tubes. When 20 of these had been prepared, about 14 c.c. technical 66° sulphuric acid was added to each tube and all were shaken for 35 minutes. The caryopses and ergots in the tubes were then washed into beakers of water, separated by pouring the contents through a fine-mesh screen, and spread out to dry on labelled paper towels. When dry, the remnants of the lemma and palea were removed by light rubbing and blowing (*J. Amer. Soc. Agron.*, xxx, pp. 446–448, 1938), after which the caryopses could readily be separated from the dark, irregularly shaped ergots and counted. These counts, subtracted from 100, gave the percentage of ergotized florets in each sample. Two men counting seed while the samples were shaking and drying were able to analyse 10 to 12 samples per man hour, or nearly double the number that could be dealt with by the old method of floret dissection.

A statistical analysis of the results of this study revealed significant differences between strains of *P. dilatatum* which had appeared to be equally susceptible to *C. paspali*. The mean ergot percentages for the 24 strains (each mean the average of the ergot analyses of 40 plants) ranged from 25·9 to 70·4, a mean difference of 7·5 per cent. being required for P = 0·05.

The technique has been applied with equal success to the determination of ergot resistance in *P. notatum* and several hybrids, but the length of the acid treatment must be modified in accordance with the thickness of the lemma and palea. The thick-glumed florets of common Bahia, for instance, must be scarified for 45 to 60 minutes, while less than half this period is necessary for lemma and palea removal in some of the thin-glumed species.

HARDISON (J. R.). **Specialization of pathogenicity in Erysiphe graminis on Poa and its relation to Bluegrass improvement.**—*Phytopathology*, xxxv, 1, pp. 62–71, 1945.

Selected groups of 398 accessions of 116 species and eight varieties of grasses in 28 genera were inoculated at the Kentucky Agricultural Experiment Station with five cultures of *Erysiphe graminis* isolated from *Poa pratensis* (Michigan, North Dakota, and Kentucky), *P. ampla*, and *P. palustris* (both State of Washington) [*R.A.M.*, xxiii, p. 231]. Each of the cultures was found to be pathogenically distinct, this constituting the first record of pathogenic specialization in *E. graminis* from *Poa*. Three of the cultures infected grasses outside the genus *Poa*, viz., (1) and (21) from *P. pratensis*, of which the former attacked *Deschampsia caespitosa*, *Festuca rubra* and its var. *commutata*, *Koeleria cristata*, *Phalaris arundinacea*, and *Phleum pratense*, and the latter *Beckmannia syzigachne*, *D. danthonoides*, *F. idahoensis*, *F. octoflora*, *F. rubra* var. *commutata*, *K. cristata*, *P. pratense*, *Pucciniella distans*, *Trisetum flavescens*, and *T. spicatum*, and (22) pathogenic to *D. danthonoides*, *F. occidentalis*, *F. octoflora*, *F. thurberi*, *K. cristata*, and *P. distans*.

Several species of *Poa*, both economic and wild, were highly resistant to all five isolates of *E. graminis*, including three collections of *P. ampla* and one each of *P. canbyi* and *P. juncifolia*, a matter of considerable importance in the Pacific

Northwest, where these species of bluegrass are a valuable component of the native forage and powdery mildew is a destructive disease. One collection of *P. pratensis* showed resistance of varying degrees to all the cultures.

Discussing the possibilities of improvement in *P. pratensis*, the writer points out that the high incidence of apomictic reproduction in the species has discouraged hybridization, instead of which individual plant selection methods have been largely utilized. However, successful hybrids between *P. arachinifera* and *P. pratensis* have been reported (*Yearb. U.S. Dep. Agric., 1937*, pp. 1032–1102, 1938) as comparing favourably, especially in dry years, with outstanding selections of the latter species. One accession of *P. arachinifera* has shown resistance to powdery mildew and other diseases, and it seems that further hybridization between this species and *P. pratensis* offers interesting possibilities, especially as a proportion of the hybrids are fertile and would therefore be amenable to plant-breeding methods inapplicable to apomictic strains.

NOBLE (M[ARY]) & GRAY (E[LIZABETH] G.). **Blind seed disease of Ryegrass.**—*Scot. J. Agric.*, xxv, 2, pp. 94–97, 1945.

Perennial ryegrass [*Lolium perenne*] is of great importance in Scotland and elsewhere in Great Britain as one of the principal grasses for sowing down to hay or pasture. To encourage seed production, a price control Order was introduced in 1942 to assure growers a reasonably remunerative return based on the purity of their material, and in this connexion an account is given of the life-history of the agent of blind seed (*Phialea temulenta*) [*R.A.M.*, xxi, p. 455; xxiv, p. 157], a virulent contaminant (also of Italian ryegrass [*L. multiflorum*]) which it is essential to eliminate from nuclear seed stocks intended for multiplication. Control measures directed towards this end are summarized.

THIRUMALACHAR (M. J.). **Two new records of Sphacelia from Mysore.**—*Nature, Lond.*, clv, 3935, pp. 395–396, 2 figs., 1945.

Collections of ergot on wild grasses made by the author in Mysore have included the sphacelial and sclerotial stages on *Brachiaria distachya* and the former, associated with abortive or immature sclerotia, on *Amphilophis pertusa*. Heavy *Cerebella* infestation was uniformly present [cf. *R.A.M.*, xxi, p. 526] and, in fact, revealed the occurrence of *Sphacelia* among a group of healthy plants. Individual flowers in the spikelets of *B. distachya* are attacked. Shortly after infection a drop of sugary secretion may be observed, at first translucent, subsequently hardening into a whitish crust with which saprophytic yeast cells are intermingled. Numerous oblong-ovate, slightly arcuate spores of the *Sphacelia*, 12·6 to 19 by 3·8 to 6·3 μ, tapering towards the apices, become embedded in the nectar. Subglobose to spherical sclerotia are formed only in the rare absence of *Cerebella*, so that the identity of the species of *Claviceps* concerned remains for the present obscure.

On *A. pertusa* also the *Sphacelia* is confined to individual florets, and here again sclerotial formation is impeded by *Cerebella*. Hyaline, triangular conidia, 8·8 to 11·4 by 6·3 to 7·7 μ, with somewhat rounded ends, are borne in profusion on a felt of conidiophores arising from the surface of the ovary. The shape of these spores being at variance with the *Sphacelia* of the *Claviceps* species recorded on other members of the Gramineae and Cyperaceae, the name of *S. amphilophidis* is tentatively assigned to the fungus, a full description and diagnosis of which is being published elsewhere.

BRICHET (J.). **Le 'crown gall' ou 'broussin infectieux' tend a s'étendre dangereusement dans les vergers.** [Crown gall or infectious excrescence is tending to spread dangerously in the orchards.]—*Fruits & Primeurs*, xiv, 149, pp. 133–134, 2 figs., 1944.

A brief, popular account is given of the symptoms and control of crown gall

(*Bacterium tumefaciens*) of fruit trees [*R.A.M.*, xxii, pp. 31, 258; xxiii, p. 379]. In Algeria, young apricot, almond, plum, and peach trees are increasingly affected, and the author has also observed the disease on 4- or 5-year-old pears and pomegranates.

LEWIS (F. H.). **Effect of spray injury on pre-harvest drop of McIntosh Apples.**—*Phytopathology*, xxxiv, 12, pp. 1015–1019, 1944.

In an experiment conducted in Wayne County, New York, in 1942, under uniform cultural conditions, the extent of perceptible foliar injury and pre-harvest drop of McIntosh apples varied significantly with the spray treatment. Co-variance analysis revealed a highly significant correlation between spray damage and pre-harvest drop, both being heavier on trees treated with lime-sulphur, lead arsenate, and lime in the cover sprays, than on those to which flotation sulphur was applied instead of lime-sulphur, while the other ingredients remained the same. On 30th September, the percentage of dropped fruits out of a total of 1,844 per tree in the block treated with the lime-sulphur formula was 47·18 compared with 24·24 for the trees sprayed with the flotation sulphur (1,759 fruits per tree), the corresponding percentages of picked fruits and crates of 1·2 bush. being 47·35 and 6·3 and 70·95 and 9·3, respectively.

HILDEBRAND (E. M.). **Myrobalan mottle and asteroid spot.**—*Phytopathology*, xxxv, 1, pp. 47–50, 2 figs., 1945.

During the last five years, two abnormalities, 'mottle' and 'asteroid' spot, have been observed in myrobalan plum (*Prunus cerasifera*) seedlings of Californian origin used as rootstocks for plum propagation in nurseries in New York State. 'Mottled' leaves are small, irregular, with undulating surfaces, and bearing dark green areas visible by reflected light. The condition is prevalent in nursery plantings but affects only a small proportion of the seedlings, usually not exceeding 5 per cent.; it is seed-borne, perpetuated by buds, and presumably of genetic origin.

'Asteroid' or 'chlorotic' spot is characterized by the development on the foliage, at any time during the growing period, of variable numbers of persistent, star-shaped, chlorotic spots, about 2 mm. in diameter, which cause distortion of the parts involved. The stem lesions are generally oval and occasionally become necrotic. All the rootstock collections so far assembled have contained a varying incidence of 'asteroid' spot—up to 90 per cent. in the 22 procured in 1942. In several tests the percentages of buds surviving and growing the following season were considerably lower than in normal seedlings, sometimes less than half. The stem growth from Italian buds inserted into diseased rootstocks was often stunted and developed typical 'asteroid' symptoms. These have been practically eliminated by raising plants from seed in the greenhouse, but the possibility of masking by high temperatures is not hereby excluded: symptomless seedlings grown in this way sometimes contracted 'asteroid' spot on transference to the field. For the present the etiology of this disorder remains obscure.

HILDEBRAND (E. M.). **The Cherry virus complex in New York.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1003, 1944.

In addition to the components of the New York cherry virus complex already described [*R.A.M.*, xxiii, p. 492], four more have been differentiated on sour cherry, namely, yellows (*Chlorogenus cerasae*), ring spot (*Annulus cerasae*), green-ring yellows, and rosette, and two on sweet cherry, tatter-leaf and mottle. The seed-transmissible crinkle on sour cherry is apparently of genetic origin. The several viruses are easily communicated by grafting from diseased to healthy material, on which distinctive symptoms are produced. On Montmorency the incubation periods of ring spot and rosette are short (about a fortnight) and those of yellows

and green-ring yellows long (a year or so), while on Black Tartarian tatter-leaf develops rapidly and mottle slowly. On peach, ring spot induces temporary necrosis and yellows causes either rosette and stunting, mosaic, or no symptoms.

HILDEBRAND (E. M.). **Can the adverse effects of virus diseases be corrected by extra fertilization and pruning the Montmorency Cherry?**—*Plant Dis. Reptr*, xxviii, 35, pp. 1057–1060, 1944. [Mimeographed.]

From 1938 to 1941, inclusive, a detailed study was made of a degeneration condition present in a Montmorency cherry orchard, and previously attributed to winter injury, but later shown by successful graft transmissions to be of a virus nature.

Four virus diseases were found to be present, viz., yellows, ring spot, green-ring yellows, and rosette [see preceding abstract]. Green-ring yellows and rosette affected only eight and two trees, respectively, out of 940; in 1941, the trees showing definite symptoms of yellows virus numbered 524, or 56 per cent. of the orchard, with an additional 265, or 28 per cent., showing early stages of infection. The confusing element in the cherry-virus complex is the ring-spot necrosis which, after the initial shock, leaves the trees almost without external symptoms, except for a mild ring spot on the unfolding leaves in spring and a reduced vitality commonly called winter injury, which is characterized by a stubby terminal growth. The only accurate way to appraise ring spot is to index young healthy trees. This was done on about a quarter of the orchard, with 38 per cent. positive results. Over 60 per cent. of the trees positive for ring spot were also affected by yellows.

Extra fertilization and drastic pruning were of no lasting benefit against these virus troubles, which were the real source of the so-called winter injury.

MILBRATH (J. A.) & ZELLER (S. M.). **Latent viruses in stone fruits.**—*Science*, N.S., ci, 2614, pp. 114–115, 1945.

The Kwanzan and Shirofugen varieties of *Prunus serrulata* are proving to be much more reliable indicators than peach of the presence of latent infection by the cherry virus complex [see preceding abstracts] in Oregon, developing severe reactions to the introduction of diseased sweet or sour cherry buds. For instance, Kwanzan budded in August with viruliferous sweet cherry buds produces small, curled leaves with split necrotic veins, which form tight rosettes with scarcely any stem elongation. Small nursery trees may die or put out new growth only below the point of bud insertion. The sweet cherry bud, however, often grows normally and may be the only living branch on the trunk. The response of Shirofugen is quite different, the area round the inserted bud becoming necrotic and embedding the scion and budding rubber in a mass of black gum by the autumn. By the following spring the stem is completely girdled for 5 to 6 in., but the foliage and new growth develop normally. With the expansion of the first leaves to full size, however, entire spurs of foliage near the canker suddenly turn brown and shrivel with the leaves still attached, and as the weather becomes warmer and drier, the whole branch beyond the point of bud insertion rapidly dies. At the same time, many branches crack at the greatly constricted site of bud insertion, whence the necrosis spreads slowly down and out into the laterals, causing symptoms similar to the foregoing. Comparable reactions occur when Shirofugen is budded after the onset of growth in the spring.

Nearly all the buds from Bing, Lambert, Royal Ann, Black Republican, Black Tartarian, and Montmorency cherry also evoked positive reactions on the two *P. serrulata* varieties under observation, preliminary tests with which gave negative results for the presence of virus on Elberta peach and Mahaleb [cherry] seedling. By means of more extensive trials (already in progress with the two last-named

species) it is hoped to locate one virus-free tree of each of the standard commercial varieties to serve as a foundation for future nursery stock.

KUNKEL (L. O.). **Transmission of virus from X-diseased Peach trees to herbaceous plants.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

With the aid of dodder (*Cuscuta campestris*) [cf. *R.A.M.*, xxiii, p. 247], a virus was transmitted from X-diseased peach trees to carrot, parsley, periwinkle [*Vinca* sp.], and tomato, and also from infected to healthy plants of each of these species, but attempts to convey it from peach or the herbaceous plants to peach gave negative results. Since the virus was transmitted from X-diseased trees in four orchards but could not be obtained from trees of healthy appearance in the same locations, it is presumed to be the X-disease virus. Tomatoes reacted to invasion by wilting and death; carrots and parsley by chlorosis of young and reddening and yellowing of old leaves; and periwinkle by yellowing of the foliage at all stages and marked floral stunting. Except for tomato, all the plants inoculated with the virus assumed an erect growth habit and gave rise to an abnormal number of secondary shoots.

DANIELS (L. B.). **The Peach mosaic disease.**—*Science*, N.S., ci, 2613, pp. 87–88, 1945.

Proof has been obtained in controlled greenhouse and field trials at the Colorado Agricultural Experiment Station and in the Western Slope region of the State that the peach mosaic virus is transmissible by *Myzus persicae* [*R.A.M.*, xxii, p. 382]. Both viviparous apterous and alate forms of the aphid were used after feeding for varying periods on diseased flowers and foliage. For the transference of the insects, infected material was suspended in the top of the test seedling to which they migrated. Eighteen out of 25 trees exposed to this mode of infestation developed mosaic symptoms, while controls of the same age grown under comparable conditions remained healthy. In the greenhouse the symptoms tended to be mild, and each test was therefore followed through at least one period of dormancy and further verified by bark-grafting into uninfected seedlings and June-budded Elberta trees. In one instance, typical mosaic symptoms appeared within 20 days in five bark-grafted trees.

NATTRASS (R. M.). **The transmission of the virus of the 'woodiness' disease of Passion Fruit (Passiflora edulis) by single leaf grafts.**—*Ann. appl. Biol.*, xxxi, 4, pp. 310–311, 1 pl., 1944 [1945].

In tests of the transmission of the virus causing woodiness disease of passion fruit [*R.A.M.*, xix, p. 664] a single leaf-grafting method was devised, in which a medium-sized leaf was removed with at least 1 in. of petiole. The latter was cut or scraped to an elongated wedge. A downward cut was made on the stock, almost parallel to the stem, which opened up a thin strip of cortex. The petiole was then inserted as far as possible, and the whole bound up with a strip of rubber tape, to make an airtight cover. With large leaves it was found advisable to cut down the area of leaf surface in order to reduce any tendency to wilt, unless the plants were to be kept in conditions of high humidity. It made no difference whether the dorsal or ventral surface was uppermost.

The advantages of the method are that one infected vine will supply material for a number of grafts over a long period, the graft can be made at any point on the stem of the stock, no supports are required, and no special precautions are necessary to keep the graft moist. Over 200 of these grafts were made in an ordinary greenhouse, and leaves grafted on to mature vines in the open during the rainy season. As a rule it is possible to tell after 24 hours whether a graft has taken, the leaf wilting when failure occurs. All types of the virus so far found have been transmitted

in this way. No difficulty was experienced in making interspecific grafts in the genera *Passiflora* and *Tacsonia*, in grafting leaves of *Passiflora* spp. on to indigenous species of *Adenia*, or in passing the virus from *Passiflora* to *Adenia*.

HERRICK (J. A.) & KEMPF (J. E.). **A study of the fungistatic and fungicidal properties and of the toxicity for mice of sodium azide.**—*J. Bact.*, xlviii, 3, pp. 331–336, 1944.

The growth of nine species of fungi of widely divergent taxonomy and habitat, namely *Aspergillus niger, Penicillium notatum, Mucor rhizopodiformis, Trichophyton mentagrophytes, Alternaria solani, Stereum gausapatum, Blastomyces dermatitidis, Histoplasma capsulatum*, and *Monilia* [*Candida*] *albicans*, was completely inhibited by exposure to 0·01 per cent. sodium azide in a liquid medium, and largely suppressed by a concentration of 0·001 per cent., but *H. capsulatum* was the only one to be killed in 24 hours by a 5 per cent. solution of the chemical. Sodium azide proved to be highly toxic to mice, and its fungistatic action was reduced tenfold by the presence of blood. It is therefore of no prospective value as a chemotherapeutic agent in fungal infections.

GROVES (A. B.). **Sulphur sprays.**—*Bull. Va agric. Exp. Sta.* 359, 22 pp., 3 figs., 1944.

Lime-sulphur remains the most economical and effective fungicide for the control of the apple diseases in Virginia, but from the standpoint of safety it is excelled by the elemental sulphurs, of which flotation sulphur is the most efficient, followed by the Grinrod, micronized, and roller-mill ground products. Only under very hot, dry conditions is injury likely to be caused by these brands of sulphur in the first two or three cover sprays, for which they may conveniently replace Bordeaux mixture. They give moderately good control of scab [*Venturia inaequalis*], but are ineffectual against bitter rot [*Glomerella cingulata*] or blotch [*Phyllosticta solitaria*]. Elemental sulphur is extensively used against peach brown rot [*Sclerotinia fructicola* and *S. laxa*] and scab [*Fusicladium carpophilum*], proprietary brands including Chipman '95', Crown, Sulfix, Dritomic, Hytox, Virginia Top, and Wet Spray.

MARSH (P. B.). **Salts as antidotes to copper in its toxicity to the spores of Sclerotinia fructicola.**—*Phytopathology*, xxxv, 1, pp. 54–61, 3 graphs, 1945.

Experiments are described, and the resultant data tabulated, showing that calcium chloride, magnesium chloride, and potassium chloride salts may counteract or antidote the inhibitory effect of copper sulphate on the germination of the conidia of *Sclerotinia fructicola*, thereby confirming the observations of Lin [*R.A.M.*, xx, p. 414]. For instance, the germination percentage in 4×10^{-7} M copper sulphate plus 0·01 per cent. glucose in the presence of 10^{-5} magnesium sulphate was 54, the corresponding figures for the 10^{-4} and 10^{-3} concentrations being 67 and 78 compared with 1·2 for the controls without added salts. The addition of calcium chloride at 10^{-5}, 10^{-4}, and 10^{-3} M to the copper sulphate permitted the germination of 31, 62, and 83 per cent., respectively, of the conidia, as against 0·8 in the controls. In the case of potassium chloride only the maximum dosage of 10^{-2} M acted in a comparable manner, allowing 59 compared with 2·9 per cent. germination.

The inimical effects of the salts on the copper compound were similarly reflected in the respiratory rates of the conidia. Thus, the consumption of oxygen in c.mm. per million spores during the seventh hour in the control series of cultures, in those containing 2×10^{-4} M copper sulphate, and the same plus 2×10^{-2} magnesium sulphate was 9·11, 0·93, and 5·00, respectively, the corresponding germination percentages after eight hours being 95, 0, and 40, respectively. When calcium chloride was added at the same concentration to the copper sulphate the oxygen consumption in c.mm. per million conidia (sixth hour) was 7·31 compared with

9·39 in the controls and 1·03 in the presence of copper sulphate alone, the corresponding germination percentages being 87, 93, and 0·02, respectively.

The high incidence of spore germination induced by the protective action of the salts was also found to be associated with decreased copper absorption. For example, the amounts of copper absorbed per million conidia in two ten-minute experiments in a mixture of 10^{-2} M calcium chloride and 10^{-4} M copper sulphate were 0·36 and 0·45 γ compared with 2·50 and 2·30 γ in the presence of the latter compound alone. Comparable results were secured with magnesium sulphate. In ten tests with copper sulphate plus calcium chloride the germination percentages ranged from 64 to 95 per cent. as against 0 to 2 per cent. in the 'minus salt' plates, the corresponding figures for magnesium sulphate being 84 to 96 and 0 to 2 per cent., respectively. The effect of potassium chloride was again weaker than that of the other two salts.

WATSON (R. D.) & NIKITIN (A. A.). **A new dust with adherence.**—Abs. in *Phytopathology*, xxxiv, 12, pp. 1013–1014, 1944.

One of the main limitations of fungicidal dusts in general is their poor adhesiveness, but this difficulty was overcome in recent tests by the addition to the standard copper-sulphur (10 : 90) dust of 20 per cent. clay and 2 per cent. highly sulphonated oil, the former ingredient being designed to assist the dispersion and absorption of the latter. The distribution of the material in this form is more uniform, and better coverage of the leaves is effected with less dust than in the case of the standard formula. Following over 3 in. rain the improved compound left an evident residue on the foliage.

American type culture collection.—4 pp., Georgetown University School of Medicine, Washington 7, D.C., 1944.

Pending the publication of a new catalogue, this leaflet lists over 200 genera represented in the American type culture collection of the Georgetown University School of Medicine, Washington, D.C. [*R.A.M.*, xviii, p. 195], and shows the total number of species and strains within each genus. The price of each culture is $2, and an additional charge of 35c. for one culture, and of 50c. for from two to seven cultures is made to cover the cost of packing and domestic postage.

DILLON WESTON (W. A. R.) & SMITH (K. M.). **Crop diseases and their control.**—*J. R. agric. Soc.*, cv, pp. 125–132, 8 figs., 1944.

The writers describe in popular terms some well-known seed-, soil-, and air-borne diseases of cereals and the viruses affecting potatoes, sugar beet, and crucifers, and suggest appropriate measures for their control.

BLUNCK (H.). **Winterschäden 1941/42 in Rheinland.** [Winter injury in 1941–2 in the Rhine Province.]—*Z. PflKrankh.*, liv, 1–2, pp. 18–36, 5 figs., 1944.

Details are given of the damage suffered by various kinds of cultivated plants in the Rhine Province during the abnormally severe winter of 1941–2. Among park and forest trees, conifers sustained relatively the heaviest losses, while evergreen ornamentals were the most susceptible of the hardwoods. At least a third of the peach stand in the vicinity of Bonn was destroyed, while sweet, sour, and ornamental cherries displayed malformations of different kinds, including an elongation of the normally inconspicuous scaly leaves into foliage leaves, a flagelliform extension of the terminal bud following the freezing of most of the short shoots with floral rudiments, and slitting of the foliage. Physiological factors are believed to be at least equally implicated with fungal infections in the calamitous dying-off of sweet cherries in the Boppard district which is increasing year by year

and constitutes a serious economic problem deserving of investigation by modern methods. The rigorous conditions also caused substantial injury in the vineyards.

Infection by *Fusarium* [*Calonectria graminicola*] was no doubt a contributory cause of the reduction in the rye crop. Particulars of seed treatment are not available, but presumably shortage of man-power and pressure of other work interfered with the normal procedure in the Rhine Province as elsewhere.

Colza plants in waterlogged soil developed a destructive root rot as a sequel to oxygen deficiency and heart necrosis under the influence of desiccating east winds in March, the latter condition also affecting cabbage.

ADDY (C. E.) & AYLWARD (D. A.). **Status of Eelgrass in Massachusetts.**—*J. Wildlife Mgmt*, viii, 4, pp. 269–275, 1 fig., 1944. [Abs. in *Exp. Sta. Rec.*, xcii, 3, p. 387, 1945.]

A survey conducted in 1943 revealed an extensive renewal of *Zostera marina* at many points along the Massachusetts coast, following a steady increase during the preceding four years, though it was nowhere as prolific as before 1930. The agent of the eelgrass disease (*Labyrinthula*) [*macrocystis*: *R.A.M.*, xxiii, p. 141] was still in evidence, but birds of various kinds were observed on the beds, which apparently provided adequate quantities of winter food. In a footnote mention is made of the occurrence, subsequent to the submission of this paper for publication, of widespread blackening and degeneration characteristic of the disease, the effects of which on the health and survival of existing beds are under investigation.

HETHERINGTON (D. C.). **Mold preventive for book bindings.**—*Science*, N.S., ci, 2618, p. 223, 1945.

A solution consisting of 10 gm. thymol crystals, 4 gm. mercuric chloride, 200 c.c. ether, and 400 c.c. benzene was effective in preventing an outbreak of mould on the bindings of books [cf. *R.A.M.*, xix, p. 635] stored in a current of damp air.

BRIEN (R. M.) & DENNE (R. W.). **Investigations into causes and control of moulds in State houses.**—*N.Z. J. Sci. Tech.*, B, xxvi, 4, pp. 174–181, 8 figs., 1945.

State houses in New Zealand within two years of completion have shown a black discoloration on plaster-board ceilings, associated with the presence of *Cladosporium herbarum*, while blue-green or yellowish moulds (*Penicillium commune*, *P. chrysogenum*, and *Aspergillus versicolor*) have been found on wall-papered surfaces. A survey by the State Advances Corporation revealed the condition in 52·7 per cent. of the houses inspected, irrespective of locality, aspect, site, or type of structure. The moulds were experimentally shown to grow only on plaster-board coated with glue size, distemper, or flour paste, and to be controllable by the addition to these materials of 2 per cent. santobrite (sodium pentachlorphenate) at the rate of $3\frac{1}{4}$ oz. per gal.

BINDAL (A. N.) & SREENIVASAYA (M.). **Studies in industrial enzymes. Part II. Malt residues as raw material for the production of fungus diastase and its application to the saccharification of cereals**—*J. sci. industr. Res., India*, iii, 7, pp. 287–289, 1945.

After pointing out that the residue obtained from barley or any other cereal during brewing and the processing of malt extract constitutes a rich substratum for the growth of *Aspergillus oryzae* and other diastase-producing micro-organisms, the authors state that the resulting mouldy residue or the extract from it can be used for the direct saccharification of cereals without subjecting them to malting [*R.A.M.*, xxiv, p. 67].

Barley, ragi [*Eleusine coracana*], jowar [sorghum], maize, bajra [*Pennisetum typhoides*], and wheat, purchased in the local bazaar, were separately steeped in

running water for 48 hours, when they began to sprout. The grains were allowed to germinate in trays until the roots were about $\frac{1}{4}$ or $\frac{3}{8}$ in. long. The grains were then sun-dried and subsequently kilned at 90° to 100° [C.] for one hour. The rootlets were removed and the malt powdered. The extract was prepared by digesting 100 gm. of the malted powder with 600 c.c. water for five to six hours at 50°. The extract was then filtered on a Buchner funnel, and the residue pressed, dried, powdered, and used as a substrate for growing *A. oryzae*.

A weighed amount (10 gm.) of each residue was moistened with 15 c.c. water in a 250 c.c. conical flask, autoclaved at 20 lb. for 30 minutes, and the residue inoculated with spores of the fungus. The flasks were then incubated at 30° for four days, being shaken at intervals. The mouldy mass was extracted, and the diastatic activity of the extract determined. The results [which are tabulated] definitely establish the eminent suitability of these residues as raw materials of much economic value in the production of industrial and pharmaceutical diastases.

The diastase-producing capacity of these residues was appreciably increased by the addition of 10 per cent. of groundnut cake.

A comprehensive study of the extent of solubilization of various cereals by treating them with a given mouldy bran (prepared by growing *A. oryzae* on wheat bran) demonstrated that in the case of barley, the process of direct enzymatic digestion yields an extract of higher specific gravity than that possessed by the extract obtained from the malted barley under similar conditions.

FAWNS (H. T.). **Food production by micro-organisms. Part III. Vitamins.**—*Food Manuf.*, xix, 11, pp. 395–400, 1944.

This is the final instalment of the author's series of articles [cf. *R.A.M.*, xxii, p. 491] indicating some of the main conclusions concerning the synthesis of food substances by micro-organisms and supplying bibliographical references to papers dealing with the subject in greater detail. The use of micro-organisms as vitamin sources is discussed.

GERSHENFELD (L.) & RUTHENBERG (W. W. W.). **Molds and yeasts in dairy products.**—*Amer. J. Pharm.*, cxvi, 7, pp. 256–267, 1944.

Potato dextrose agar was found to be the most suitable of the various standard media tested at the Philadelphia College of Pharmacy and Science for the estimation of moulds, notably *Oospora lactis*, and yeasts in dairy products, viz., buttermilk, cream cottage cheese, butter, and sour cream [*R.A.M.*, xxiv, p. 26] of which the last-named was subjected to intensive studies to determine the causes of contamination. In addition to plate counts, smears were made from the sour cream as received and after 24 hours' incubation at 70° F. The data secured by the two methods were substantially in agreement, the microscopic examination being particularly valuable in the case of heavy contamination. The impurities were attributed in the main to defective sterilization of equipment, exposure of the cream to air, contaminated cultures, and an excess of moulds and yeasts in the processing plants. The trouble was effectively combated by the application of a chlorine rinse (100 p.p.m.) or spray (200 p.p.m.) to the machinery, culture rooms, incubating tanks, coolers, pasteurizers, bottles, &c., and other precautions to ensure sterility.

LINDEGREN (C. C.). **Heterocaryosis and heterosis in the fungi; their biological and industrial significance.**—Abs. in *Genetics*, xxx, 1, p. 13, 1945.

Heterocaryosis is stated to be the natural condition of the filamentous Ascomycetes. In *Neurospora crassa*, for instance, the natural heterocaryon generally contains both plus and minus nuclei, but these are ordinarily incompatible when originating in the same locality, and intra-strain sterility limits hybridization to

matings between cultures from different sources. The genetical obstacle to fertility can be removed either by anastomoses with another strain or by the diffusion of hormones or vitamins into the substratum. A homocaryon obtained from a freshly isolated mononucleate cell soon becomes heterocaryotic by mutation, and most old cultures can be shown to comprise a variety of genotypes. This phenomenon tends to reduce the potency of penicillin-producing cultures of *Penicillium notatum* [*R.A.M.*, xxiv, p. 27]. One artificially developed heterocaryon of the mould was found to have a much lower capacity for penicillin production than that of either original culture. Another heterocaryon between an average and a high producer possessed the same potency as the latter, thus showing that the low producer was deficient in some substance essential for penicillin production which was supplied in excess to the combination by the higher producer.

LEE (S. W.), FOLEY (E. J.), & EPSTEIN (JEANNE). **Plant growth substances and Penicillium notatum.**—*Nature, Lond.*, clv, 3933, pp. 333–334, 1945.

In experiments at the Wallace Laboratories, Inc., New Brunswick, New Jersey, to determine the effect of the hormones indole-3-acetic acid and α-naphthalene acetic acid on penicillin production by *Penicillium notatum*, the former, at 1 in 10,000, gave the most rapid high titre of the antibiotic (50 Florey units per ml. six days after inoculation of the Czapek-Dox brown sugar medium), while the latter was more active at 1 in 100,000 (50 units in seven days).

WIEDLING (S.). **The production of antibiotics by Penicillium species.**—*Bot. Notiser, 1944*, pp. 433–443, 2 graphs, 1944.

Using an adaptation of the cylinder-plate method of Abraham *et al.* [*R.A.M.*, xx, p. 484] and modifications of the Czapek-Dox [loc. cit.] and Raulin-Thom media (*Lancet*, ccxlv, p. 625, 1943), the author tested the antibiotic action on *Staphylococcus aureus* of a number of *Penicillium* species, only five of which, namely, *P. brunneo-violaceum*, *P. chloroleucon*, *P. chrysogenum*, *P. citrinum*, and *P. griso-roseum*, showed any remarkable inhibitory properties. Of these, *P. brunneo-violaceum*, *P. chloroleucon*, and *P. griso-roseum* are here recorded for the first time as sources of an antibiotic substance. The activity of *P. chrysogenum* and *P. griseo-roseum* was of the same order of magnitude as Fleming's strain of *P. notatum*, while that of the other three species was slighter.

WEIMER (J. L.). **Macrophomina root and stem rot and anthracnose of Chamaecrista.**—*Phytopathology*, xxxiv, 12, pp. 1077–1085, 3 figs., 1944.

Chamaecrista procumbens and *C. fasciculata*, commonly known as partridge or sensitive pea, are low, woody annuals growing wild along highways and on waste ground in the south-eastern United States, where their ability to survive such adverse conditions suggested the possibility of utilization in the prevention of soil erosion. For this purpose the plants are under investigation in Soil Conservation Nurseries. The present studies were conducted in Alabama and Georgia.

Both species are liable to virulent infection by *Glomerella cingulata*, the agent of anthracnose, while *C. procumbens* is also susceptible to root and stem rot (*Macrophomina phaseoli*). *G. cingulata* can destroy seedlings in a few days, but in the case of older plants only the actively growing ends of the branches are subject to attack.

MAGROU (J.), BOUGET (J.), & BOUGET (C.). **Sur un pied de Pomme de terre dépourvu de tubercules.** [On a Potato stool deprived of tubers.]—*Ann. Inst. Pasteur*, lxxi, 1–2, pp. 42–43, 1945.

In the course of experiments involving the sowing of potato seed at Bagnères-de-Bigorre (Pyrenees) in mycorrhizal soils [*R.A.M.*, xxiii, p. 452], a seed fell on the soil of a disused greenhouse bench exposed to frost and desiccation. Notwithstanding

these adverse conditions, the seed thus accidentally sown germinated and produced a very vigorous plant, which was, however, destitute of tubers in contrast to the plants arising from seed in the mountain soils. A comparative examination of the root systems revealed a profusion of actively growing mycorrhizal endophytes in the latter which were completely absent from the former. This unplanned test lends further weight to the hypothesis, based on repeated observations, of a correlation between adjustment to mycorrhizal symbiosis and tuberization.

McKay (R.) & Clinch (Phyllis E. M.). **Leaf roll infection in the Potato varieties Skerry Champion, Shamrock, and Matador.**—*J. Dep. Agric. Éire*, xli, 2, pp. 200–208, 5 figs., 1944.

After pointing out that potato inspectors in Éire have consistently maintained that leaf roll is scarcely ever seen on the Shamrock and Skerry Champion varieties, the authors describe an experiment in which six plants of Skerry Champion and six of Shamrock were grown in pots in the greenhouse and top-grafted with infected scions. Most of the grafted plants later showed primary leaf roll in the axillary shoots, and a year later the tubers of all units gave plants with secondary leaf roll. No difficulty was experienced in detecting the presence of the disease in Skerry Champion, the symptoms being of the ordinary medium type. On the other hand, the diagnosis of leaf roll in Shamrock in the field was by no means easy, affected plants were small and slightly chlorotic, particularly at the tops, while there was a reduction in yield of about 50 per cent. Further experiments clearly demonstrated that both Skerry Champion and Shamrock were susceptible to sprout infection with leaf roll by means of aphids. To test susceptibility to natural infection in the field, six plants each of Skerry Champion, Shamrock, Arran Cairn, Golden Wonder, President, and Champion were grown in short drills alternating with drills of infected British Queen. During the season, none of the Skerry Champion or Shamrock plants showed primary leaf roll, though one Skerry Champion tuber failed to grow. The tubers of all the plants were grown the following year, when the number of infected units was Skerry Champion 0, Shamrock 1, Arran Cairn 5, Golden Wonder 5, President 5, and Champion 4, in each case out of 6. Similar experiments were made in 1940, 1941, and 1942. In this study, Skerry Champion gave 100, 78, and 2 per cent. infection by stem grafting, sprout infection by aphids, and natural infection in the field (6, 87, and 46 plants tested), respectively, Shamrock 100, 51, and 8 per cent. (6, 41, and 95 plants tested), respectively, and President 92 and 89 per cent. for sprout infection by aphids and natural infection, out of 26 and 18 plants tested, respectively.

When Matador plants were grown out-of-doors, the disease showed up plainly in the lower leaves when they were about seven weeks old. The affected units were somewhat stunted, and the margins of the lower leaflets were rolled slightly upwards. The terminal leaflet of the lower leaves showed a pale, yellowish-green colour, which contrasted with the normal green of the rest of the foliage. When the plants were in full flower the rolled leaflets opened, and only the margins presented a slight upward curvature. The pallid appearance of the terminals of the basal leaves persisted, remaining the most prominent indication of the presence of the disease. When scions from these plants were grafted on to President, typical leaf roll developed in the stocks. Over a period of three years, the disease caused a reduction in yield of about 58 per cent.

The data obtained confirm the view that Shamrock is able to withstand intensive infection in the field, and demonstrate that Skerry Champion is resistant almost to the point of immunity under field conditions. The symptoms on Skerry Champion are such that they are not likely to be overlooked; in Shamrock, on the other hand, the disease may be more prevalent than has been realized.

CLINCH (PHYLLIS E. M.), LOUGHNANE (J. B.), & MCKAY (R.). **Notes on the leaf roll and mosaic diseases of Potatoes in relation to seed Potato production.**—*J. Dep. Agric. Éire*, xlv, 2, pp. 263–276, 11 figs., 1944.

These notes are a slightly amended form of those prepared by the authors in 1940 and issued by the Department of Agriculture, Dublin, for the use of their Potato Inspectors. The diseases dealt with are leaf roll, which is stated to be comprehensively dealt with in Leaflet 29 of the Department of Agriculture, Dublin, and mosaic. Brief notes are given on the symptoms and insect transmission of the former, and the susceptibility of different varieties is indicated. The mosaic diseases dealt with are those caused by potato viruses X (simple mosaic virus), B (Up-to-Date streak virus) [a strain of X: *R.A.M.*, xxiii, p. 403], A, Y (leaf-drop streak virus or veinbanding virus), F (tuber blotch or pseudo-net necrosis virus), and G (aucuba mosaic virus). The paper concludes with brief notes on the following diseases due to combinations of viruses: crinkle (X+A), rugose mosaic (X+Y), and interveinal mosaic (X+F).

BEKIUS (J.). **Bladrolziekte en potergroote bij Aardappel.** [Leaf roll disease and seed size in Potatoes.]—*Tijdschr. PlZiekt.*, xlviii, pp. 69–71, 1942. [Abs. in *Z. PflKrankh.*, liv, 1–2, pp. 44–45, 1945.]

Field experiments carried out in 1940 to verify the opinion, now widely held in the Netherlands, that small, early-harvested seed potatoes produce healthier plants, especially in respect of leaf roll, than large ones lifted later, gave partially confirmatory results. The tubers of early-harvested plants produced stands with less leaf roll and mosaic than those lifted at maturity, but as regards the latter, the progeny of small tubers was little or no healthier than that of large ones. Much weightier are the objections to the use of small seed, such as slow growth, late ripening, and low fertility. A second trial in 1941 with the Roode Star variety afforded proof of the well-known fact that the tubers of leaf-roll plants give a much lower yield (50 per cent. in this instance) than those of healthy stands.

SILBERSCHMIDT (K.). **O valor diagnóstico de alterações das qualidades fisiológicas dos tubérculos para o reconhecimento do grau de degenerescência das Batatinhas.** [The diagnostic value of alterations in the physiological qualities of the tubers for the recognition of the degree of Potato degeneration.]—*Ceres, Minas Gerais*, v, 29, pp. 326–351, 1944.

This is a critical survey of the literature on the diagnosis of potato 'degeneration' by means of modifications in the physiological properties of the tubers. Most of the papers cited have been noticed from time to time in this *Review*.

LARSON (R. H.). **The identity of the virus causing punctate necrosis and mottle in Potatoes.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

Evidence is forthcoming to identify the virus causing potato punctate necrosis and mottle [in Wisconsin] as an aberrant strain of the potato latent ring spot virus [potato virus X: *R.A.M.*, xxiii, p. 240]. It is readily transmissible by plant extract but not by aphids, remains infective *in vitro* for about a month at 20° to 22° C., tolerates a dilution of 1 to 10,000, and is inactivated by ten minutes' exposure to a temperature of 66° to 67° and by drying. Severe symptoms develop in potatoes kept at 14° to 16° and very mild ones at or above 24°. All the Solanaceae tested were easily infected. *Atropa belladonna* is a symptomless carrier; necrotic lesions are produced on the inoculated leaves of *Amaranthus reflexus* and *Digitalis lanata*, in which the virus is not systemic; and potato seedling 41956 is immune.

MUNCIE (J. H.), MOORE (H. C.), TYSON (J.), & WHEELER (E. J.). **The effect of sulphur and acid fertilizer on incidence of Potato scab.**—*Amer. Potato J.*, xxi, 11, pp. 213–304, 1944.

At the Michigan Agricultural Experiment Station trials have been carried on for several years on the effect of soil acidity on the incidence of potato scab (*Actinomyces scabies*). Untreated tubers of the susceptible Chippewa variety were planted in infested soil and treated with sulphur and with an acid-forming fertilizer composed of ammonium sulphate, acid superphosphate, and potassium sulphate, these two materials being applied together and separately. The soil was considered too acid for optimum growth. Applications of acid alone or in combination with sulphur ploughed-under or disked-in reduced scab infection, though it was still abundant. There was a general increase in yield of clean, saleable tubers. When the acidity was raised in the following years the amount of scab was reduced, but so was the yield of saleable tubers. The maximum benefit was obtained from applications of 1,600 lb. sulphur per acre. When the acidity was low, not only was scab not fully inhibited, but it gradually adapted itself to the condition. When the crop was grown in acid soil and the plot was later treated with lime, scab became more severe, indicating that the disease was only inhibited and not destroyed. After sulphur was added for a second and third year there was a marked decrease in the percentage of clean tubers, although the acidity had shown little increase.

WHEELER (E. J.), STEVENSON (F. J.), & MOORE (H. C.). **The Menominee Potato; a new variety resistant to common scab and late blight.**—*Amer. Potato J.*, xxi, 11, pp. 305–311, 1944.

In a number of areas in the United States, scab (*Actinomyces scabies*) is becoming such a limiting factor in potato production that the present commercial varieties will have to be abandoned and replaced by resistant sorts. Menominee, though possessing the disadvantage of a late-maturing habit and rough tubers, is being distributed for this purpose: about 2,800 bush. were produced in 1943, most of which was to be grown in 1944 for increase. It is a selection from a cross between the scab-resistant Richter's Jubel and the low-yielding but resistant Seedling 44537. It is highly resistant to scab and moderately so to late blight (*Phytophthora infestans*). Tests show that the yield, whether reckoned as total yield or in U.S. No. 1 potatoes, is much greater than that of either Russet Rural, Chippewa, or Sebago. It has not been much affected by leaf roll or mosaic and possesses other attractive commercial qualities.

BRICHET (J.). **Conservation des Pommes de Terre de saison. La 'fusariose' ou 'pourriture sèche'. L'emploi de la réfrigeration.** [Preservation of maincrop Potatoes. 'Fusariosis' or 'dry rot'. The application of refrigeration.]—*Fruits & Primeurs*, xiv, 150, pp. 156–159, 2 figs., 1944.

Dry rot (*Fusarium*) [spp., including *F. coeruleum*] is the most destructive agent of storage rot among maincrop potatoes in Algeria, where the conditions generally obtaining in warehouses and depots, including a constant temperature above 20° C. and a relative humidity exceeding 80 per cent., might be specially selected for the cultivation of the pathogen rather than for the preservation of perishable foodstuffs. Some improvement in the present storage arrangements may be effected by sanitary reforms, but the only radical method of cure lies in the provision of refrigerating installations in which the temperature and atmospheric humidity can be regulated in such a way as to promote the health of the potatoes and suppress the development of the fungi. The results of investigations by F. Weiss and collaborators in Pennsylvania [*R.A.M.*, vii, p. 739] have shown that these objects may be attained by the maintenance of a temperature of 5° to 7° C. and a relative humidity of about 60 per cent. The expense thus incurred would be

amply counterbalanced by the gain of the half of the crop now lost through preventable disease.

HEUBERGER (J. W.) & WOLFENBARGER (D. O.). **Preliminary report on DDT in the Potato fungicide program.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1003, 1944.

DDT (dichloro-diphenyl trichlorethane), $\frac{3}{4}$ in 100, alone or in combination with other fungicides, had no effect on early blight (*Alternaria solani*) on Dakota Red potatoes.

GLICK (D. P.), ARK (P. A.), & RACICOT (H. N.). **Outline of procedure for the diagnosis of Bacterial ring rot of Potatoes. [Report of the Committee of the Potato Association of America.]**—*Amer. Potato J.*, xxi, 11, pp. 311–314, 1944.

In this report, based on a questionnaire, suggestions are made for the diagnosis of bacterial ring rot (*Bacterium* [*Corynebacterium*] *sepedonicum*). In the field the affected plants may show wilting, rolling of leaves or leaflets, loss of colour, and eventually death, which may not, however, involve all the stems of the plant. If the stem is cut across near the base a creamy exudate may appear. It should be cut across again about $\frac{1}{2}$ in. lower and squeezed slightly. If the tuber is cut across near the stem end a cheesy, cream to light brown rot may exude. This also applies to the examination of stored tubers, in the case of which ultra-violet light may also be used, but must be confirmed by other tests. For definite establishment of the presence of disease as, for example, when recourse to law is contemplated, the exudation must be further tested as follows: (1) Gram-staining of smears from the tuber or better from the lower part of the cut stem afford the most reliable test: the bacteria show as brilliantly stained short rods or elliptical to inequilateral forms, 0·3 to 0·5 by 0·6 to 0·9 μ; (2) the causative organism is isolated and identified; (3) infection is transmitted to a suitable host which itself must answer the tests.

It is pointed out that there will always be a small percentage of cases where positive diagnosis is impossible, and then the next year's crop should be carefully watched.

SIMPSON (G. W.) & PORTER (W. F.). **A roguing service for producers of foundation seed Potatoes.**—*Misc. Publ. Me agric. Exp. Sta.* 584, 21 pp., 1944.

In this publication details are given of the roguing service directed by the Maine Agricultural Experiment Service for the benefit of growers of foundation seed potatoes, and suggestions made for the management of the plots. It was in 1939, in answer to the demand for a good seed, that growers and public agencies in Maine started a foundation seed programme to provide for themselves part of the seed required by growers in the State. The programme has never given more than 25 per cent. of the seed needed, but it has proved helpful in the introduction of some of the newer varieties. The results have fully confirmed the view that seed sources can be maintained by growers within the State.

Among the chief factors in the successful handling of foundation seed plots are (1) a source of seed known to be free from bacterial ring rot [*Corynebacterium sepedonicum*: *R.A.M.*, xxiii, p. 271], (2) early planting by tuber units, (3) isolation, (4) thorough roguing, (5) early harvesting, and (6) storage on the farm where contamination of seed stocks will not occur. If these conditions are observed, growers can be reasonably well assured of securing satisfactory seed.

All fields to be rogued under the supervision of the Experiment Station should be planted by the tuber-unit method. Early planting is essential. The planting of foundation seed plots must be finished before commercial plantings are begun on the same farm. Strong emphasis is laid on the recommendation that early-harvested seed should be sorted for size well ahead of planting and each size planted in a particular area of the plot.

The Experiment Station undertakes to employ roguers and supervise their work. The roguers have to detect and remove diseased units and varietal admixtures. All plants removed for whatever reason are placed in roguing bags and taken to the end of the row. Growers must provide some means for the disposal of diseased tops, The charge for the roguing service is $30 per acre, less any saving in costs.

The bulletin also includes a note by Steinbauer and Steinmetz on the use of chemicals for the elimination of rose, buckthorn [*Rhamnus*], and other aphid hosts.

PARACER (C. S.) & LUTHRA (J. C.). **Further studies on the stem-rot disease of Rice caused by Sclerotium oryzae Catt. in the Punjab.**—*Indian J. agric. Sci.*, xix, 1, pp. 44–48, 1944.

Rice is one of the staple food grain crops of the Punjab hills, where the crop, which occupies about 1,000,000 acres, is subject to a number of fungal diseases, of which stem rot (*Sclerotium oryzae*) [*Leptosphaeria salvinii*: *R.A.M.*, xx, p. 447] is the most serious and the cause of heavy damage. In some years, this disease destroys half to three-quarters of the crop, while losses of 5 to 15 per cent. are common every year. Infection is most prevalent in the Sheikhupura, Gujranwala, Karnal, and Gurdaspur areas, and is met with to a small extent in the hills.

A study [the results of which are tabulated] of the effect of certain environmental factors upon the disease demonstrated that infection can be reduced by late sowing and late transplanting, but these measures are not recommended. Incidence is increased by keeping water stagnant in the fields throughout the growing period. Nitrogenous manures favour the disease; at Lyallpur Botanical Farm during the years 1935 to 1939, inclusive, for example, the average infection was 27·8 per cent. when sulphate of ammonia was applied at the rate of 1,000 maunds [1 maund = 82·284 lb.] per acre, as against 4·25 per cent. in the untreated control. Of 19 Punjab rice varieties tested, the most resistant were Basmati 370, with 0·1 per cent. average infection for 1935 to 1939, inclusive, at Lyallpur and 1·6 per cent. for 1935 and 1936 at Kala Shah Kaka, Basmati 3, the corresponding infection figures for which were 1·8 and (not tested), Mushkan 7, with 1·1 and 1·1 per cent. infection, Mushkan 41, 1·8 and 3 per cent., and Bara 62, 1·7 and 0·9 per cent.

The control measures recommended include burning diseased rice stubble *in situ*, erecting strong, high 'bunds' round infected fields to check spread by wind and irrigation water, not allowing stagnant water to remain in the fields, and planting resistant varieties.

CHOLODNY (N. G.). **On volatile organic compounds evolved by living organisms and assimilated by soil microbes.**—*C.R. Acad. Sci. U.R.S.S.*, xli, 9, pp. 398–400, 1943.

The results of studies conducted at the University of Kiev in 1939–40 showed that the germinating seeds of various plants release into the surrounding atmosphere volatile organic substances, which in some cases, e.g., peas, appear to contain nitrogen. Using the method already described [*R.A.M.*, xv, p. 527] of incubating soil dust on the surface of clean glass, the author found that the substances in question are intensively assimilated by various micro-organisms, chiefly bacteria and Actinomycetes. Having regard to the immense mass of seeds, tubers, and other plant organs germinating in the soil, and the living roots by which it is penetrated, this source of nutriment may be expected to play an important part in the life of the soil microflora and should be considered in the formation of a general quantitative estimate of the circular exchange of matter in the biosphere. Incidentally, the emanations from ripe apples were observed to exert a powerful stimulus on the growth of Actinomycetes [cf. ibid., xxiii, p. 335].

WEIBEL (R. O.). **Effect of seed treatment on Castor Beans.**—*J. Amer. Soc. Agron.*, xxxvi, 11, pp. 953–954, 1944.

Castor bean [*Ricinus communis*] seed of the Kentucky 38 variety planted in the greenhouse at the Illinois Agricultural Experiment Station in April, 1944, responded favourably to treatment with arasan and new improved ceresan, which raised the percentage of total emergence from 29·5 to 64·5 and 72·5, respectively. The latter preparation, besides giving a larger increase in the stand, was more effective than the former in preventing post-emergence losses from damping-off. In a field test in May with comparably treated seed, however, the results were less encouraging, the average total emergence (four replications) for the arasan and ceresan plots being only slightly higher than the controls (76·7, 73·5, and 71 per cent., respectively).

RAGL (F. X.). **History of the fight against Peronospora in Germany.**—*Dtsch. Brauindustr.*, lii, p. 161, 1944. [Abs. in *J. Inst. Brew.*, N.S. xlii, 2, pp. 99, 1945.]

Peronospora [*Pseudoperonospora humuli*] was first observed on hops on a large scale in Germany in 1924, when it was named 'brown cone' [*R.A.M.*, iv, p. 635]. In 1926 it was responsible for a reduction in yield in Bavaria to the value of RM. 30,000,000 [ibid., vi, p. 751]. In general, growers were very reluctant to follow the recommendations for spraying with an alkaline copper solution. From 1918 to 1926, the average hop yield was 7·2 zentner [720 kg.] per ha.; in 1926 it fell to 3·2, as a result of which 6,000 spraying equipments were sold and treatment started early in the following May, raising the output for the period 1927 to 1935 to 14·4 zentner per ha.

[An abstract of this paper was published in the Swiss *Rev. Brass.*, *1944*, p. 55, 1944.]

NELSON (R.). **Present status of wilt-resistant hybrid Mints and plans for their further development.**—*Proc. Mich. Muck Fmrs' Ass.*, xxv, pp. 38, 40, 1943. [Abs. in *Plant Breed. Abstr.*, xv, 2, p. 176, 1945.]

Peppermint × spearmint [*Mentha spicata*] hybrids combining satisfactory resistance to wilt (*Verticillium* [? *dahliae*]) with other attractive qualities have been developed at the Michigan State College [*R.A.M.*, xvi, p. 491], where two seedlings in particular promise well as potential substitutes for English peppermint.

CHOWDHURY (S.). **Diseases of Pan (Piper betle) in Sylhet, Assam. IV. Rhizoctonia root-rot.**—*Proc. Indian Acad. Sci.*, Sect. B, xx, pp. 229–244, 2 graphs, 1944.

The root rot of *Piper betle* caused by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xxiii, p. 457] is responsible for heavy losses wherever the crop is grown in Sylhet, Assam, the percentage of mortality ranging annually from 2 to 47·7 in the different 'borojes' (straw- or grass-sided houses on a bamboo framework). The disease is most prevalent during October and November. Pallor and drooping of the leaves are the first external symptoms of the attack on the root system. The tissues of the girdled areas of the stem at or just below soil-level turn black, and the roots are reddish and disintegrated. The pathogenicity of the fungus was established by inoculation experiments, involving (*a*) infection of the plants by direct contact and (*b*) infestation of the soil with rice straw cultures.

Mycelial growth and sclerotial formation were most profuse on oat, Czapek's, potato dextrose, and *P. betle* extract agars, Brown's synthetic agar being very unsatisfactory as a substratum. Depth of the medium was another important factor in sclerotial development, which was heavier in dishes containing 70 c.c. Czapek's agar than in those with 40 or 20. A normal concentration was the most conducive to the production of sclerotia, which were not formed at all above that point and only in comparatively small numbers below it. The optimum tempera-

ture for this phase in the life-history of the pathogen appears to be between 25° and 30° C., and the most favourable hydrogen-ion concentration is P_H 6·2. Nitrogen, supplied in the form of sodium nitrate, ammonium sulphate, or ammonium chloride, was found to be essential to sclerotial growth. Potassium dihydrogen phosphate was equal to potassium phosphate in the promotion of sclerotial formation, but magnesium phosphate and potassium nitrate were of relatively little value for this purpose.

C. solani made the most rapid mycelial growth at 28°, the minimum temperature permitting development being above 10° and the maximum between 35° and 40°. The thermal death points of the mycelium and sclerotia in five-minute exposures were 51° and 59°, respectively. Mycelial growth in cultures and in the soil was inhibited by solutions of 0·09 per cent. mercuric chloride, 0·30 per cent. copper sulphate, and 0·03 per cent. formaldehyde, but the fungus would probably be more resistant in the stem tissues. The sclerotia succumbed to 2½ hours' immersion in mercuric chloride (1 in 834) whereas a period of eight hours was necessary for cold formaldehyde (1 in 240) to produce comparable effects. These organs retain their viability for 2½ years in the laboratory and for five and seven months, respectively, on the surface of moist and dry soils in the field.

Control of the root rot may be effected by monthly irrigations of the plants along the ridges with a solution of kerol (1 in 1,400) or 2–2–50 Bordeaux mixture, beginning in September and ending in December. Soil sterilization by means of heat is a simple and effective method of prevention, carried out by burning rice straw, thatching grass, &c., until a temperature of 60° to 65° in the upper 9 in. is reached, the operation being performed four times and the soil thoroughly turned on each occasion.

McMartin (A.). **Fungicidal treatment of Sugarcane cuttings.**—*S. Afr. Sug. J.*, xxiv, 12, p. 509, 1944.

The most promising of the fungicides tested for the control of pineapple disease of sugar-cane [*Ceratostomella paradoxa*] of recent years in Natal are those containing some form of organically combined mercury, of which only aretan and ceresan appear to be on sale in the country at the present juncture [*R.A.M.*, xxiv, p. 166]. Two other proprietary brands that have given satisfactory results are verdasan and agrosan. Aretan and verdasan are used at a strength of 0·5 per cent., ceresan and agrosan at 1 per cent. For canes of average diameter, such as Co. 281, 301, and 331, about 1 oz. per acre of the solution is required for single-stick planting, while for thicker varieties, e.g., P.O.J. 2725, the amount must be proportionately increased. The cost per lb. of aretan is 7*s.*, so that taking ¼ lb. per acre as an average figure, the treatment of an area of this extent would involve an outlay of 1*s.* 9*d.*

The same author contributes the opening section (pp. 511, 513) of Experiment Station Notes. A laboratory experiment was conducted in which the four above-mentioned preparations, thiosan, tulisan, spergon, vasco 4, cuprocide, nomersan, and arasan were applied to infected cuttings of Co. 331, ten being used for each treatment. After three weeks in a moist chamber, all the cuttings dipped in the first six were healthy, while the figures for those treated with the last five and for the controls were 8, 6, 6, 3, 3, and 4 out of 10, respectively. In another test, in which the pathogen was inoculated into the interior of the cuttings before treatment, no control was obtained, indicating that the fungicides are effective against external contamination only. When the ends of the cuttings were dipped in a spore suspension of *C. paradoxa* before treatment, infection was inhibited for only one week by verdasan, aretan, ceresan, agrosan, arasan, and spergon. In a field experiment the germination of the cuttings planted on 4th August after treatment with aretan, ceresan, spergon, verdasan, agrosan, and arasan was very significantly superior to that of the controls, the number of buds grown out of 1,200 on

13th November being 681, 623, 535, 707, 599, 540, and 370, respectively. Judged by the total population of shoots on the same date, only the aretan-treated material was significantly better than the controls (3,205 as against 1,493), but agrosan, verdasan, ceresan, arasan, cuprocide, and spergon also exerted a stimulatory effect on the number of cuttings growing one bud or more, viz., 272, 292, 284, 257, 267, and 270, compared with 274 for aretan and 194 for the controls, and might reasonably be expected to produce correspondingly large total populations at later dates.

CROSS (W. E.). **Nuevos datos sobre el 'carbón' en las distintas variedades de Caña de Azucar.** [New data on 'smut' in the individual Sugar-Cane varieties.]—*Bol. Estac. exp. agric. Tucumán* 50, 35 pp., 1944.

From this fully tabulated survey of the performance in respect of smut [*Ustilago scitaminea*] of the sugar-cane varieties grown in Tucumán, Argentina [*R.A.M.*, xxiii, p. 408], it appears that up to the time of writing in December, 1944, only six of the 295 classified a year earlier as practically immune from the disease had acquired a greater degree of susceptibility, necessitating their transference to the category of severe infection. Conversely, 15 of the 74 varieties previously ranking as highly susceptible have developed a capacity to withstand the disease which warrants their inclusion in the group of mildly infected and resistant canes.

ARENTSEN (S.). **Hongos Uredinales que atacan a nuestros cultivos.** [Fungi belonging to the Uredinales that attack our crops.]—*Agric. tec. Chile* (formerly *Bol. Sanid. veg. Chile*), iv, 1, pp. 54–56, 1944.

A list is given of 22 rusts parasitizing economic crops in Chile [cf. *R.A.M.*, xxiii, p. 476].

WHIFFEN (ALMA J.). **A discussion of taxonomic criteria in the Chytridiales.**—*Farlowia*, i, 4, pp. 583–597, 1 fig., 1 diag., 1944.

The author discusses the criteria on which a system of classification of the Chytridiales [*R.A.M.*, xxiv, p. 74] might be based and proposes that the monocentric Chytrids be grouped into two families, according to whether the zoosporangium proceeds from the encysted zoospore, as in the Rhizidiaceae, or from the germ-tube of the zoospore (Entophlyctaceae). A key to the genera of the monocentric Chytrids is furnished. For the present it seems advisable to retain in one family, the Cladochytriaceae Sparrow [ibid., xxii, p. 327] emend. Whiffen, the nine genera of the polycentric Chytrids.

HIRSCHHORN (ELISA). **Una especie de Ustilago nueva para la flora uruguaya (Ustilago microthelis Sydow).** [A species of *Ustilago* new for the Uruguayan flora (*Ustilago microthelis* Sydow).]—*Not. Mus. La Plata*, vii, pp. 21–26, 2 figs., 1 graph, 1942.

Erianthus trinius is recorded as a new host for *Ustilago microthelis* in Uruguay, and the smut is critically compared with *U. sacchari* and *U. scitaminea* [*R.A.M.*, xxiv, p. 74].

GREENE (H. C.). **Notes on Wisconsin parasitic fungi. IV.**—*Farlowia*, i, 4, pp. 569–581, 1944.

Continuing the critical studies of the late J. J. Davis on the parasitic fungi of Wisconsin [*R.A.M.*, ix, p. 272; xxii, p. 374], the writer discusses, *inter alia*, the identity of the *Gloeosporium* responsible for a prevalent foliar die-back of greenhouse orchids, including species of *Cattleya*, *Cymbidium*, *Laelia*, *Odontoglossum*, and *Phalaenopsis*. Pending the opportunity for the further examination of a larger supply of material the pathogen is provisionally referred to *G. cinctum*. Consider-

able variation in the shape and size of the conidia was observed and it may be that more than one species of *G.* is involved.

A fungus characterized by light brown, elongated, somewhat flattened pycnidia, 200 to 500 by 75 to 125 μ, hyaline, simple, slender conidiophores, 5 to 6 μ in length, and hyaline, ellipsoid to subcylindrical conidia, 4 to 8 by 3 to 3·5 (mostly 6 to 7 by 3) μ, observed on *Panicum virgatum* leaves, was at first believed to be a species of *Sporonema*, but on subsequent evidence it is tentatively assigned to an early stage of 'tar spot' (*Phyllachora graminis*).

Cercospora alni n.sp. Chupp & Greene was collected on alder (*Alnus crispa*) leaves.

Wilted plants of *Astragalus canadensis* were found to be attacked by *Fusarium moniliforme* [*Gibberella fujikuroi*] and *F. tricinctum* or a closely related species. The former was present in abundance, and is probably the primary agent, though a necrotic virus may be involved and the fungi act only as secondary invaders, as has occurred on leguminous plants in California.

Dicoccum nebulosum was found on *Fraxinus americana* in a nursery in the University of Wisconsin arboretum.

RYJKOFF (V. L.) & SOUKHOV (K. S.). Влияние веществ, подавляющих и активирующих действие ферментов на некротическую реакцию, вызываемую вирусом **Nicotiana 1.** [The influence of substances inhibiting and activating the operation of the enzymes on the necrotic reaction induced by the *Nicotiana* 1 virus.]—*Биохимия* [*Biochemistry*], ix, 4, pp. 154–160, 1944. [English summary.]

When half leaves of a hybrid between *Nicotiana tabacum* and *N. glutinosa*, inoculated with the tobacco mosaic virus, were immersed in or floated on the surface of solutions of sodium fluoride, iodoacetate, soluble methyl-naphthoquinone, nicotinic acid, and riboflavin at concentrations of 0·05, 0·01, 0·05, 0·05 per cent., and full strength, respectively, necroses developed in the ordinary way. They were inhibited, however, in similar material placed within 24 hours of inoculation in ascorbic acid, cysteine, and thiamin at 0·05, 0·002, and 0·005 per cent., respectively. On transference to pure water, mosaic lesions began to appear in the half leaves that had been in contact with ascorbic acid and thiamin, showing that the action of these two substances is reversible.

CLAYTON (E. E.). **Resistance of Tobacco to blue mold (Peronospora tabacina).**—*J. agric. Res.*, lx, 3, pp. 79–87, 3 figs., 1945.

Tests with over 1,000 collections have failed to show any variety of tobacco possessing resistance to *Peronospora tabacina* adequate to provide a basis for a breeding programme. Tests with other species of *Nicotiana* have shown that some, especially Australian species, are highly resistant under certain conditions, the age factor being most important; they are susceptible up to six or eight weeks old, or if poorly developed, or when exposed to exceptionally severe attacks of infection. Successful crosses have been made between tobacco and *N. debneyi*, *N. megalosiphon*, *N. longiflora*, and *N. plumbaginifolia*. Work is in progress with the progeny.

VALLEAU (W. D.). **Can Tobacco blue-mold fungus be eradicated?**—Abs. in *Phytopathology*, xxxiv, 12, p. 1012, 1944.

Tobacco blue mould [*Peronospora tabacina*] was general in the Georgia-Florida area from 1931 onwards, but only in 1937 did it become prevalent in the Tennessee-Kentucky zone of cultivation, indicating that the latter does not lie in the direct line of spore dissemination from the former. During the last seven years the incidence of infection in the Tennessee-Kentucky area has gradually fallen, until in 1944 only two cases were recorded. It would appear, therefore, that *P. tabacina*

cannot maintain itself indefinitely north of the Georgia-Florida region, and there the eradication of overwintering living plants and the use of new seed-bed sites should result in the complete eradication of the pathogen from the eastern tobacco-growing zone in a comparatively short time.

HOPKINS (J. C. F.). **Diseases of fruit, flowers, and vegetables in southern Rhodesia. 9. Diseases of Tomatoes.**—*Rhod. agric. J.*, xlii, 1, pp. 81–87, 8 figs., 1945.

The author gives brief, popular notes on the symptoms and control of tomato diseases commonly present in Southern Rhodesia, including damping-off (*Rhizoctonia* [*Corticium*] *solani*), leaf spot (*Septoria lycopersici*), buck-eye rot (*Phytophthora parasitica*), mouldy fruit rot (*Rhizopus nigricans*) [*R. stolonifer*], water wound rot due to various bacteria, physiological blossom-end rot, green back and fruit cracking due to sun injury and, perhaps, potash deficiency, mosaic, bunchy top [*R.A.M.*, xv, p. 124: xvii, p. 442], and spotted wilt, only one instance of which on tomatoes has so far been recorded in the Colony [ibid., xix, p. 568].

The non-parasitic diseases of Tomatoes.—*Agric. Gaz. N.S.W.*, lvi, 1, pp. 17–20, 4 figs., 1945.

Several diseases of the tomato are not of fungal origin, though they may facilitate the attack of secondary fungi, but are due to cultural conditions. Blossom-end rot may be due either to an insufficient supply of water from the roots in hot weather, when water may be withdrawn from the fruit to the leaves, or to clogging of the soil with too much water, or to a deficiency of superphosphate and excess of nitrogenous fertilizer. The same causes may result in abnormal flower production and poor pollination leading to blossom-drop. Cold and rain will also bring about this condition. Excess of moisture in the air or soil produces leaf roll resembling that of potato in appearance, but it does not as a rule affect the yield of fruit. Sunscald, the appearance of a white or yellow patch on the 'shoulder' of the fruit, is due to exposure through defoliation by early blight [*Alternaria solani*], *Septoria* spot [*S. lycopersici*], or tomato mite.

Notes on growth cracks and soil deficiencies are also given.

NAGEL (C. M.). **A new organic fungicide, 2, 3, dichloro-1, 4-naphthoquinone : its value as a control for certain defoliation diseases of the Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1009, 1944.

In experiments on the control of three agents of foliar diseases on Victor tomatoes, namely, *Phytomonas* [*Xanthomonas*] *vesicatoria*, *P.* [*Pseudomonas*] *punctulans*, and *Septoria lycopersici*, 2, 3, dichloro-1, 4-naphthoquinone, applied at 1½ lb. per 100 gals. water four times between 14th July and 17th August, markedly excelled all the other materials tested in the maintenance of the leaves without damage to the plants.

ANDRUS (C. F.) & REYNARD (G. B.). **Resistance to leaf spot and its inheritance in Tomatoes.**—*Phytopathology*, xxxv, 1, pp. 16–24, 2 figs., 1945.

All the 127 commercial tomato varieties tested at the Southeastern Regional Vegetable Breeding Laboratory, Charleston, South Carolina, for their reactions to *Septoria lycopersici*, inoculum of which was prepared by means of a mechanical liquefier [*R.A.M.*, xx, p. 546], proved highly susceptible, but some degree of resistance was observed in 12 out of 267 accessions adjudged to be of *Lycopersicon hirsutum* or *L. peruvianum* descent [ibid., xxii, p. 502], or to have originated through out-crossing with some primitive type. The maximum degree of resistance is expressed by abnormally small, dark reddish-brown lesions, bearing few or no pycnidia. The results of inheritance studies of crosses between the susceptible varieties Rutgers and Victor and the resistant M6 line were made on 916 F_2 plants,

as well as on 3,630 F_3 offspring and 20 true and pseudo-back-crosses, the latter involving Gulf State, Montgomery, Pan America, and Indiana Marglobe, indicated that resistance, represented by the circumscribed type of lesion (symbol Se se), is inherited as a single dominant factor.

REYNARD (G. B.) & ANDRUS (C. F.). **Inheritance of resistance to the collar-rot phase of Alternaria solani on Tomato.**—*Phytopathology*, xxxv, 1, pp. 25–36, 1 fig., 1945.

Following up earlier investigations [*R.A.M.*, xxii, p. 116], the writers conducted experiments at the United States Vegetable Breeding Laboratory, Charleston, South Carolina, involving the crossing of tomato lines uniformly resistant and uniformly susceptible to the collar-rot phase of *Alternaria solani* and the analysis of succeeding generations for their reactions to the disease. A total of 500 F_1 seedlings, 15 F_2 populations, 251 F_3 families, and 23 back-cross populations composed of crosses between resistant and susceptible parent lines was tested, the plants being inoculated in the seedling stage, grown in soil on greenhouse benches, and classified in five grades according to the severity of the resultant infection.

Unequivocal segregation for resistance occurred in the hybrids and the analysis of F_2, F_3, and back-cross populations indicated a simple form of inheritance in which one pair of factors is concerned. An intermediate type of response was observed in which susceptibility to collar rot appeared to be only partially dominant over resistance. The resistance of plants of the F_2 and subsequent generations seemed to be equal to that shown by the parent lines.

The forcing variety, Devon Surprize, was used as the principal collar rot-resistant parent, while the susceptible progenitors included Rutgers, Valiant, Victor, Gulf State, Marglobe, Montgomery, Stokesdale, Pan America, Mingold, Red Pear, Red Cherry, and Vetomold. By an adaptation of Langford's system of symbols for reactions to *Cladosporium fulvum* [ibid., xvi, p. 571], the factor pair governing resistance to the collar-rot phase of *A. solani* is designated 'Ad-ad'.

BARRATT (R. W.) & RICHARDS (M. C.). **Physiological maturity in relation to Alternaria blight in the Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 997, 1944.

All tomato varieties and selections available at the moment have been found susceptible to *Alternaria solani* when tested under conditions favouring infection. Differences in the extent of field defoliation from this cause were shown by three years' experiments to be related to the physiological maturity of the plants. A correlation was further established between the period of yield and time of defoliation irrespective of variety. Early varieties, or early plantings of a variety, lose their foliage prematurely because they begin to yield early. A connexion likewise exists between the fruit load of a plant, expressed by the fruit to leaf quotient, and defoliation, evidence of which was secured in an experiment on 16 varieties with a wide range of production, the change in the quotient being followed in four varieties by means of weekly samples.

ELAZARI-VOLCANI (ZAPHIRA). **Observations on Sclerotinia sclerotiorum in Palestine.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 206–207, 1944.

Sclerotinia sclerotiorum is stated to be continually extending its host range in Palestine, among the important diseases of economic crops for which it is responsible being fruit and stalk rots of vegetable marrows and eggplants and fruit rots of bananas and oranges. In an inoculation test to determine the pathogenicity of the fungus to tomatoes, one out of five seedlings contracted the disease after 16 days, sclerotia being detected in the pith of its wilted stalk. All the controls remained healthy.

Apothecia [cf. *R.A.M.*, xx, p. 76] have very rarely been observed to develop

from sclerotia in the field, but during the cold winter of 1941–2 they were produced on citrus fruits after transference to the laboratory, on the soil of a vegetable marrow plot and tomato seed-bed near Tel Aviv, and on the soil in the pots used in the above-mentioned tomato experiment. The diameter of the apothecial disk measured 3 to 15 mm., the length of the stalk 5 to 35 mm., and the spores 9 to 12 by 4·5 to 6·5 μ.

The minimum, optimum, and maximum temperatures for mycelial growth in glucose agar cultures were 4°, 14° to 25°, and between 30° and 35° C., respectively. Slight discrepancies between these results and those of other workers suggest the desirability of a comparative study of material of *S. sclerotiorum* from a variety of geographical sources.

WALLACE (E. R.). **Didymella stem rot of Tomato.**—*Kirton agric. J., 1945*, 10, pp. 21–3, 1945.

Brief notes are given on *Didymella* [*lycopersici*], first recorded from Lincolnshire in 1942 [*R.A.M.*, xxii, pp. 378, 467; xxiv, p. 90]. Control measures are indicated.

KENDRICK (J. B.). **Rhizopus stem blight of Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

A species of *Rhizopus* resembling *R. nigricans* [*R. stolonifer*] has been isolated from the internal discoloured pedicel and stem tissues of canning tomato plants in central California, where the fungus is responsible for a troublesome fruit rot and subsequent blighting of the stems. Growth cracks or other injuries provide the means of ingress on fruits that have ripened early, usually under heavy foliage where atmospheric humidity is rather high. Invaded fruits are converted first into soft, watery masses and then into mummies, whence the fungus frequently enters the pedicel, fruit spur, and main branch. The entire fruit spur is blighted and elongated, dark brown, sunken lesions develop on the main branch above and below the point of attachment of the spur. The yellowing and blighting of the foliage following the attack on the main branch are liable to confusion with wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*].

PAVLÍK (M.). **Eine neue Bakteriose der Tomaten? Vorläufige Mitteilung.** [A new Tomato bacteriosis? Preliminary note.]—*Z. PflKrankh.*, liv, 1–2, pp. 1–4, 1944.

Diseased tomato fruits from Lodenitz (Lower Danube) examined in 1942 bore scab-like lesions, 3 to 5 mm. in diameter, surrounded by a yellowish to greenish halo, which gave rise on various standard media at 27° C. to a non-spore-forming, actively motile, Gram-positive bacterium, 0·8 to 2·5 by 0·5 to 0·8 μ, occurring singly or in pairs and furnished with peritrichous flagella. Glucose, lactose, and saccharose were fermented without gas formation, nitrates reduced to nitrites, gelatine liquefied, bouillon clouded, milk coagulated, litmus milk acidified, and indol formed, but hydrogen sulphide was not produced, nor were starch or cellulose dissolved.

Inoculation experiments on green or half-ripe, freshly-gathered tomatoes resulted in the development of whitish, watery areas, 2 to 5 mm. in diameter, from which the organism described above was isolated. Although it is probably the agent of the fruit spot, no definite conclusions as to its part in the etiology of the disease can be drawn pending an opportunity for the artificial infection of tomatoes on growing plants.

WRIGHT (E.). **Relation of macrofungi and micro-organisms of soils to damping-off of broadleaf seedlings.**—*J. agric. Res.*, lxx, 4, pp. 133–141, 2 figs., 1945.

In greenhouse and field tests carried out on Marshall silt loam soil at the Nebraska Agricultural Experiment Station from 1937 to 1939, an apparent correlation was

observed between the occurrence of macrofungi and the frequency of damping-off in broadleaf seedlings [*R.A.M.*, xxiv, p. 38]. The sporophores of *Cyathus vernicosus*, for instance, were prevalent in soils favourable to the growth of the seedlings in which the incidence of disease was low, whereas in the case of *Naucoria semiorbicularis* and *Coprinus* spp. the position was reversed. In general, the larger the number of fungi in the soil, the heavier were the losses from damping-off, an abundance of bacteria, on the other hand, usually connoting only slight reductions from this source. A yellow *Aspergillus* predominated in peptone-glucose agar dilution plates from soil sample, and on dried agar-coated slides. On the basis of the data so far obtained, it appears unlikely that detailed microbiological analyses of the soil will prove of practical utility in the prediction of losses from damping-off.

SCHWERDTFEGER (F.). **Die Waldkrankheiten. Ein Lehrbuch der Forstpathologie und des Forstschutzes.** [Forest diseases. A text-book of forest pathology and forest protection.]—479 pp., 230 figs., Berlin, P. Parey, 1944. Rm. 24. [Review in *Z. PflKrankh.*, liv, 1–2, pp. 38–39, 1945.]

The reviewer, [H.] Blunck, points out that the present manual is the first attempt, since the publication of Morstatt's 'Introduction' two decades ago [*R.A.M.*, ii, p. 562], to compile a phytopathological text-book, and it is restricted to one branch of the subject. Within these limits, however, the material is comprehensively handled, the term 'disease' being interpreted in its broadest sense, and comprising, besides pathogenic agents proper, various non-parasitic troubles, including smoke injury and adverse soil conditions. Special attention is devoted to silvicultural hygiene and therapy.

GRUENHAGEN (R. H.). **Hypoxylon pruinatum and its pathogenesis on Poplar.**—*Phytopathology*, xxxv, 1, pp. 72–89, 1 fig., 2 diags., 4 graphs, 1945.

The prevalence of the canker caused by *Hypoxylon pruinatum* on poplar (mostly *Populus tremuloides* and *P. grandidentata*, *P. balsamifera* being affected to a lesser extent) [*R.A.M.*, xix, p. 505] was investigated in Wisconsin during the summers of 1941 to 1943. The disease, the leading source of infection on poplars in the Lake States, especially on poor growing sites, was found on an average of 24 per cent. of all the trees examined, characteristic features of the invaded stands including broken trees, dead stubs, and blackened areas on the green trunks. Cankers that girdled branches produced brown 'flags', and if the branches beyond the site of infection were not dead, the foliage was usually stunted and pallid. Incipient cankers appeared as yellow to orange, slightly sunken lesions in the bark, generally with irregular, lobate margins, while at a later stage blister-like conidial fructifications and erumpent perithecial stromata were plainly discernible.

H. pruinatum attained its maximum diameter and produced the heaviest weight of mycelium in 2 per cent. malt agar cultures at 28° C.; good growth was made over the range from 20° to 28° but none occurred at 4°, 8°, or 36°. The optimum hydrogen-ion concentration was P_H 5·6, with satisfactory development from 4·5 to 6·5. Malt agar was the best of the several standard media tested for rapidity of development and conidial production.

The organism is a wound parasite on branches and trunks, but buds, leaves, petioles, and leaf axils did not contract the disease. Only a moderate percentage of infection developed from inoculations made through cuts, but all experiments in which the trunk and branch bark was bruised and wounded before the insertion of the inoculum were successful. The fungus penetrated the bark, cambium, and a distance of 8 mm. into the wood.

Overwintering was shown to be effected by means of the mycelium in the host tissues and ascospores, and the organism is also disseminated by wind. In spore-trap experiments the conidia were detached under both wet and dry

conditions, but free water was necessary for ascospore discharge, which did not take place in the early spring or late autumn when the mean temperature was below 45° F.

The above-mentioned bruised-tissue inoculation technique has enabled a method to be developed for testing the relative resistance to *H. pruinatum* of various poplar selections.

BRETZ (T. W.). **Observations on phloem necrosis of Elm in Kentucky, Ohio, Indiana, and Illinois.**—*Plant Dis. Reptr*, xxviii, 35, pp. 1056–1057, 1944. [Mimeographed.]

After stating that phloem necrosis [*R.A.M.*, xxiv, p. 126] has caused extensive dying of elms in scattered parts of the State of Missouri, particularly in St. Louis and Kansas City, where the American elm [*Ulmus americana*] and its varieties are extensively planted for shade purposes, the author points out that as the disease is new to Missouri, it is difficult to predict what course it will take. A journey to Lexington, Kentucky, where the disease is thought to have been present for many years, Dayton, Ohio, where it has been known since 1927, and Columbus, Ohio, where it was very damaging in 1944, was therefore undertaken to obtain information on this point. On the trip to Kentucky and on the return to Missouri from Ohio, evidence of phloem necrosis was observed at scattered points across southern Illinois and Indiana. Near Lexington, many planted elms 15 to 25 years old were affected. Here, however, a number of native elms survive, which antedate the earliest supposed occurrence of phloem necrosis, and have, presumably, been intermittently exposed to the disease, as indicated by the active development of the condition in younger trees in recent years. This strongly suggests that these trees are resistant to, and possibly immune from, phloem necrosis. Evidence of the disease was observed along the route from Lexington to Cincinnati. Between Cincinnati and Dayton, elms were very scarce, while in the latter city the destruction appeared to be almost complete; the number of dead and dying trees exceeded the number of healthy ones noted, and it was estimated that 20,000 trees had died from the disease in 1944. In Columbus, the disease likewise destroyed many thousands of trees during the past season.

PRICE (W. A.) & TILSON (H. G.). **Some plant and insect problems of Kentucky nurserymen during the year ended June 30, 1944.**—*Bull. Ky agric. Exp. Sta.* 41, Regulatory Ser., 20 pp., 1944.

Particulars are given of the Kentucky Nursery Inspection Law and its application to some well-known pests and diseases occurring in the State during 1943–4.

Service and regulatory announcements, December, 1944. Plant-quarantine import restrictions, Union of South Africa.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 65–66, 1944.

By Proclamation No. 48 of 1940, Portuguese East Africa may be added to the list of countries from which a certificate of absence of *Synchytrium endobioticum* is not required to accompany consignments of potatoes for South Africa.

From and after the date of publication of Government Notice 1282 (1942), no person shall introduce into the Union, unless under a specially written authorization of the Secretary of Agriculture and Forestry, any timber or wood (*a*) with bark adhering to it, or (*b*) infested by insects or infected by fungi.

List of current quarantine and other restrictive orders and miscellaneous regulations.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 66–72, 1944.

Summaries are given of the domestic and foreign quarantine and other restrictive orders now operative in the United States.

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JONES (E. W.). **Biological flora of the British Isles. Acer L.**—*J. Ecol.*, xxxii, 2, pp. 215–252, 1 pl., 2 figs., 2 graphs, 2 maps, 1945.

Most of the fungi associated with *Acer* in the British Isles are saprophytes, but considerable damage may at times be inflicted on *A. pseudoplatanus* by *Uncinula aceris* and *Rhytisma acerinum*, the last-named being almost ubiquitous on sycamores except in the smoky atmosphere of large manufacturing cities. *U. aceris* is more prevalent than *R. acerinum* on *A. campestre*. Other organisms not confined to *Acer* but injurious to representatives of the genus include *Polyporus squamosus*, the agent of sycamore heart rot, *Phytophthora cactorum* [*R.A.M.*, xx, p. 326], causing the death of seedlings, and (on badly pruned street trees only) *Nectria cinnabarina*.

WOJTYLKO (E.). **Das Fichtensterben durch Hallimasch im Bereich der Forstverwaltung Rzyki der Herrschaft Saybusch O.-S. Nach dem Stand vom Frühjahr 1942.** [The dying-off of Spruce caused by the honey fungus in the Rzyki forest administration zone of the domain of Saybusch, Upper Silesia, according to its status in the spring of 1942.]—*Tharandt. forstl. Jb.*, xciii, 11–12, pp. 659–676, 4 figs., 1 graph, 1 map, 1942. [Received December, 1944.]

This is a detailed account, with special reference to the prevailing meteorological, geological, and ecological conditions in the Saybusch district of Upper Silesia, of a dying-off of spruces in that locality caused by the honey fungus (*Agaricus melleus*) [*Armillaria mellea*]. The disease is almost exclusively confined to pure stands, where its symptoms first become noticeable on trees of an average age of 40 years and reach a climax at 50 to 70. According to information elicited from foresters long resident in the affected zone, shrivelled trees in the final stages of the malady were little in evidence before 1930, but from 1935–6 onwards their numbers increased progressively until in 1942 they represented 65 per cent. of the assessment.

The foci of infection originate in groups, which in the course of the next three to five years spread over scattered areas of 1 to 2 ha., recognizable by the presence of the clustered elder [*Sambucus racemosa*]. Within these well-defined zones, the writer examined 127 trees, the otherwise undamaged root systems of which showed incipient symptoms of attack by *A. mellea*, and observed that in 94 per cent. the mycelium developed on the roots extending in an easterly direction. In most cases the mycelium radiated from two or three brownish centres, 2 to 4 sq. mm., situated near the root-collar on the surface in contact with the soil. Running in the direction of the junction between root and trunk, the mycelium partially encircles the collar and induces a necrosis of the conducting vessels, which appears as a brownish streak 5 to 10 cm. wide at the base of the tree and narrowing towards the crown. A layer of resin, 0·5 to 2 cm. in width, is formed between the necrotic and the living cells, or the substance may be deposited in the shape of inclusions of up to 0·25 l. Already at this stage the fresh, dark colour of the needles is overlaid with a grey-green tint. The duration of the disease, from the first visible signs to the drying-up of the trunk, accompanied by a sudden shower of needles, ranges from one or two

years in the case of 10-year-old stands to between seven and ten for those of 50 to 60 or upwards. The wood of trees attacked by *A. mellea*, if felled in good time, i.e., when the shower of needles is observed, may safely be classed as grade B, but any timber left standing until a later stage will be of inferior quality and should not be utilized in any damp or airless parts of buildings, though it is quite suitable for the roof.

The paper concludes with recommendations for silvicultural practices based on the renewal of the old, diseased, pure spruce stands by means of an admixture of fir [*Abies*], larch, and beech.

GOSSELIN (R.). **Studies on Polystictus circinatus and its relation to butt-rot of Spruce.**—*Farlowia*, i, 4, pp. 525–568, 3 pl., 6 graphs, 1944.

From a critical study of the taxonomy of the spruce butt-rotting fungus originally described by Fries as *Polyporus circinatus*, which is of local importance in Quebec as an agent of excessive windfall [*R.A.M.*, xxi, p. 57], the writer concludes that the organism should be referred to *Polystictus circinatus* (Fr.) Cooke [ibid., xxi, p. 174]. Associated with this species and hitherto identified with it is *Polyporus tomentosus* Fr., which may be distinguished from the foregoing by its brighter-coloured sporophores and its predominant occurrence on the ground, and is likewise regarded as belonging to *Polystictus*, the combination *P. tomentosus* (Fr.) Fr. being accepted. The whole confusion between the two species is attributed by the author to Fries's description of the context of *Polyporus tomentosus* as homogeneous, whereas in both the fungi under discussion it is duplex. In *Polystictus circinatus*, however, the setae are preponderately curved, while those of *P. tomentosus* are straight. A list is given of the herbarium specimens of the fungus available for study and their correct systematic position.

An intensive survey was made to determine the prevalence of *P. circinatus* in Quebec. Near Mt. Albert, on the northern side of the Gaspé Peninsula, the incidence of infection amounted to 100 per cent., while it ranged from 20 per cent. in the valley near Lake Walker (north bank of the St. Lawrence) to 90 per cent. on the mountain slope in the same area and 95 per cent. along the York River. On the other hand, no sign of the butt rot could be observed in the Laurentide National Park.

Crowding did not appear to be a decisive factor in the development of *P. circinatus*, which also occurred both in pure spruce stands and in those with an admixture of firs below 60 per cent. Unlike *P. tomentosus*, however, it was not observed in mixed stands of hard- and softwoods.

Temperature and humidity are the most important factors in sporophore development, which is promoted by the cool and moist conditions prevailing after 15th August and during September. The southern limit of *P. circinatus* appears to be reached at the 36th parallel of longitude.

No external signs of disease accompany the early stages of infection, which takes place through the lateral roots, but in the later ones the foliage turns yellowish-green and resin may be exuded from the stem bases.

LUMSDEN (G. Q.). **New woods for cross arms and their preservation.**—*Bell Lab. Rec.*, xxii, 14, pp. 573–576, 4 figs., 1944.

War-emergency demands for coastal Douglas fir [*Pseudotsuga taxifolia*] and southern pine [*Pinus* spp.] timbers, normally used by the Bell System for the support of their open-wire lines, have necessitated recourse to the most readily available substitutes, red and jack pines [*P. resinosa* and *P. banksii*] and inland [? Douglas] fir for the same purpose. Cross-arms of these species were treated, 1,100 at a time, by an improved hot- and cold-bath non-pressure process, involving two to four hours' immersion in a tank containing creosote heated to above 220° F.,

followed by a similar period in 5 per cent. pentachlorphenol in an aromatic petroleum at 90° to 125°. The retention of preservative solution averaged about 8·5, 6·4, and 0·6 lb. per cu. ft. for *P. resinosa*, *P. banksii*, and inland fir (heartwood). After curing about 8,000 of the treated arms were installed by the Associated Telephone Companies for periodic observation in line. Breaking tests on samples at Chester, New Jersey [*R.A.M.*, xxiii, p. 246] indicated that inland fir is practically as strong as coastal Douglas fir and southern pine, and red and jack pines 80 per cent. as durable, the latter degree of strength being considered sufficient, except in extra long spans under heavy loading conditions. Equally promising results were obtained in Canada by the similar treatment of red and jack pine cross-arms.

WEISS (F.). **Viruses described primarily on leguminous vegetable and forage crops.**—*Plant Dis. Reptr, Suppl.* 154, pp. 32–80, 1945. [Mimeographed.]

This is the second in a series of descriptive lists of plant viruses in course of preparation by the Committee on Virus Classification and Nomenclature, American Phytopathological Society [cf. *R.A.M.*, xxiii, p. 438]. The aim of this compilation is merely to present an organized summary of the available literature on the subject, no attempt having been made to resolve problems on which further research is required. As far as possible, the common names for the viruses are in conformity with those used in the *Review of Applied Mycology*, a list of which was issued by the Imperial Mycological Institute on 1st January, 1944 [ibid., xxiii, p. 79].

FOSTER (H. H.) & PINCKARD (J. A.). **Control of Cabbage mildew by means of benzene vapour.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1000, 1944.

Benzene vapour, applied nightly from 24th November (36 hours after inoculation with *Peronospora parasitica*) to 28th December to experimental seed-beds of early cabbage in Mississippi, resulted in an average of 256 seedlings per sq. ft. compared with 158 for the untreated controls, the average lengths of the two lots being 4·9 and 2·8 in., respectively. The most effective practice consisted in the use of 50 c.c. benzene per 15-gm. cotton ball suspended in the seed-bed at 2-yd. intervals, evaporation being prevented by the use of wet covers with a thread count of 48 by 44. Very satisfactory control was also secured after the development of mildew in farm beds by the use of 50 c.c. benzene per sq. yd. on three nights of each week until the formation of the first true leaf. After the conclusion of the treatments cold, wet weather intervened, and was followed by an outbreak of the disease, indicating the necessity for continued applications until the seedlings are transplanted to the field.

MILLARD (W. A.). **Canker and mosaic of Broccoli.**—*J. Minist. Agric.*, lii, 1, pp. 39–42, 1945.

During the last eight years the broccoli crop throughout England has been on the decline as a result of canker (*Phoma lingam*), always troublesome in the north, and mosaic cauliflower mosaic virus [*R.A.M.*, xxii, p. 122], which appears to have spread from south-western areas northwards. In some instances, these diseases have been so severe that the entire crop has been destroyed. Canker develops in the autumn after planting and becomes increasingly conspicuous in the spring and summer on plants left for seeding. It appears as a dark brown wound or lesion on the stalk, generally on one side only, though sometimes girdling the stem. The lesion varies in length from ½ to 2 in. The outer tissues become badly cracked lengthwise. The inner flesh is dry, brown, and dead sometimes as far as the centre of the stalk. The flower head is small and unmarketable, or the stalk may break. Good control has been obtained by seed treatment in hot water (122° F. for 25 minutes), but the best method is to raise disease-free seed, by growing the treated seed as far away

as possible from all cruciferous crops and carefully removing all suspicious plants during the season.

Mosaic has recently been far more serious and widespread than canker. Old *Brassica* crops should be ploughed in or burnt, while plants kept for seed should be sprayed against the aphid carrier [*Brevicoryne brassicae*] during the second or third week of May with a wash consisting of 3 oz. nicotine (96 to 98 per cent.), 4 lb. soft soap, and 40 gals. water, or dusted on a warm day with a 4 per cent. nicotine dust. The main crops should be treated in the same way in early and late July. Any plants that become infected should be removed and burnt.

HOOKER (W. J.), WALKER (J. C.), & LINK (K. P.). **Effects of two Mustard oils on Plasmodiophora brassicae and their relation to resistance to clubroot.**—*J. agric. Res.*, lxx, 3, pp. 63–78, 3 figs., 2 graphs, 1945.

Allyl isothiocyanate occurs in the roots of horse-radish and beta-phenethyl isothiocyanate in those of cabbage, the former, and probably the latter, as its glucoside. Either of these two mustard oils above a certain concentration inhibits spore germination in *Plasmodiophora brassicae* [*R.A.M.*, xxii, p. 507]. By weight they are nearly equally toxic so that the molecular toxicity of the phenethyl oil is nearly twice as great as that of the allyl oil. The toxicity was tested by inoculating young cabbage plants with spore suspensions treated with each of the oils. In this case the molecular toxicity appeared to be nearly equal. At concentrations below the toxic level the oils stimulated germination, but the results were less consistent in the case of the beta-phenyl oil. To produce the same effect a greater concentration of spores required a greater concentration of the mustard oil. The concentration of potentially available beta-phenethyl isothiocyanate in the roots is roughly comparable with the concentration required to prevent disease development, but this is true of both resistant and susceptible crucifers. The liberation of this oil in appreciable quantities has not been demonstrated and it seems unlikely that the concentration could be maintained as high outside the plant as inside. If oil concentrations in the soil solution were below the toxic level a stimulatory effect on *P. brassicae* spores may conceivably be induced. In fact, it is possible that the mustard oils, if present in the soil solution in the proper concentration, may actually predispose cruciferous plants to infection rather than control it. Allyl mustard oil does not stimulate all spore development, for it fails in the case of *Colletotrichum circinans*.

LEACH (L. D.). **Sugar-beet diseases.**—*Sug. Beet Bull.*, ix, 1, pp. 1–8, 12 col. figs., 1945.

Popular, descriptive notes are given on some well-known sugar-beet diseases in the United States, accompanied by excellent coloured reproductions of photographs to assist in the identification of the symptoms.

HULL (R.) & WATSON (M[ARION] A.). **Virus yellows in Sugar-beet root and seed crops.**—*Kirton agric. J.*, 10, pp. 45–48, 1945.

This brief, semi-popular paper contains suggestions for the control of sugar-beet yellows [*R.A.M.*, xxii, p. 123] in eastern England.

HARTER (L. L.) & ZAUMEYER (W. J.). **A monographic study of Bean diseases and methods for their control.**—*Tech. Bull. U.S. Dep. Agric.* 868, 160 pp., 30 figs., 3 maps, 1944.

The available information concerning the etiology, geographical distribution, economic importance, symptomatology, morphology and physiology of the causal organisms, modes of dissemination and transmission, and other points of interest, is summarized and critically discussed in this valuable compilation on field and

garden (*Phaseolus vulgaris*) and Lima (*P. lunatus* var. *macrocarpus*) bean diseases in the United States. In addition to fungal and bacterial pathogens, the bulletin deals with virus and parasitic disorders of the crops, and is supplemented by a bibliography of 571 titles.

PERSON (L. H.). **Parasitism of Rhizoctonia solani on Beans.**—*Phytopathology*, xxxiv, 12, pp. 1056–1068, 4 figs., 1944.

Rhizoctonia [*Corticium*] *solani* is the agent of damping-off and a reddish-brown stem rot of beans in Louisiana, and investigations were carried out at the State Agricultural Experiment Station to determine whether 27 isolates of the fungus from some of its many other hosts were pathogenic to *Phaseolus vulgaris*.

Twelve isolates from eight hosts varied considerably in growth in Petri dish cultures at seven temperatures between 6° and 38° C. [*R.A.M.*, iii, p. 361; viii, p. 138; xx, p. 618; xxii, p. 86, *et passim*], only a trace being made at the minimum by strains from tomato, eggplant, and bean, compared with 6 to 9 mm. for the other nine. The optimum and maximum temperatures also varied for the several isolates, the former ranging from 20° to 25° for the potato strain and from 25° to 30° for the others, while the sugar-cane, bean, and one of the two sugar beet isolates grew slowly at 38°, which was lethal to the remainder.

Four fairly clear-cut groups were differentiated on the basis of their pathogenicity to beans in greenhouse and field soil-infection tests, namely, (1) comprising isolates from sugar-cane and from sclerotia on potato tubers, which did not noticeably affect beans; (2) those from peas, causing a very slight degree of damping-off and moderate stem infection; (3) the rice strain, which almost entirely prevented emergence but produced less severe stem lesions than the pea isolates; and (4) isolates from bean, tomato, eggplant, and sugar beet, responsible for some reductions in the stands and heavy damage to the stems. As already observed by Fulton (*Bull. La agric. Exp. Sta.* 101, 1908), uninjured plants wilted as frequently but less rapidly than slightly wounded ones following inoculation with *C. solani*.

In further greenhouse experiments on soy-beans, peas, cowpeas, and broad beans, in comparison with beans, the sugar-cane and potato strains were as harmless to the supplementary legumes as they were to beans, while the destructive rice strain was equally pathogenic to peas, cowpeas, and broad beans, but less so to soy-beans. The two pea strains, which caused little damage to beans, varied in their effects on three of the other hosts, one being fairly pathogenic to soy-beans (stands reduced from 49 to 24 per cent.) and almost entirely preventing the emergence of peas and broad beans, while the other did not injure soy-beans to any extent and was only moderately virulent on peas and broad beans: both isolates were of medium pathogenicity to cowpeas. The three strains from bean, one each from eggplant and tomato, and two from sugar beet, all of which caused comparable reductions in bean stands, differed on soy-beans, peas, and cowpeas, the sugar-beet strains being less virulent than the others on the first two and non-pathogenic to the last-named. All these strains prevented the emergence of broad beans.

The non-pathogenicity of the sugar-cane and potato isolates is of interest and may assume practical importance in connexion with the rotation system in the alluvial sections of Louisiana, where these hosts of *C. solani* are economically valuable.

HOLDSWORTH (M.) & HEATH (O. V. S.). **Ripening of the Onion bulb and infection by Botrytis species.**—*Nature, Lond.*, clv, 3933, p. 334, 1945.

The writers have observed a number of cases of infection, apparently by *Botrytis* spp., of the swollen bulb scales of onions [*R.A.M.*, xxiii, p. 161], another probable

path of invasion being provided by the pores of the older leaves, which sag open as they wither and form humid pockets for the lodgment and germination of air-borne spores. This mode of infection leads to the development of neck rot, in which the leaf base tissues are killed high up on the neck near the pores, where the whole neck may, in fact, be rotted through before the bulb shows any external symptom of the disease. In this connexion the common horticultural practice of bending the plants over at the neck to hasten maturity is considered likely to promote the entry of the pathogens by breaking or bruising the next emerging leaf blade.

WILSON (J. D.). **The control of Celery blights with Bordeaux, the fixed coppers with and without sulphur, and fermate.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 227, pp. 95–109, 1944.

Since the author and Newhall submitted their programme for spraying and dusting against celery early and late blights (*Cercospora apii* and *Septoria apii*) in 1930 [*R.A.M.*, x, p. 220], the fixed-copper compounds have been introduced and developed for fungicidal purposes. Their performance in relation to the control of the celery pathogens has been investigated in numerous experiments during the last ten years, and still more recently various 'organic' materials have been tested for the same object. Bordeaux mixture was included as a standard treatment in nearly all the tests on muck-grown crops herein described, mostly at a strength of 8–8–100 (8–12 and 8–4 in a few instances), and consistently ranked at or near the top of the list in blight control and yield increases. In 38 individual comparisons with copper compounds, it ranked first 32 times and was significantly superior in 11 of those trials. In 12 comparative experiments with six fixed coppers covering a seven-year period, copper A excelled in four out of every five yield assessments, followed in decreasing order of effectiveness by copper oxychloride sulphur (COC-S), cuprocide, copper hydro 40, tribasic, and cupro-K, comparable ratings being assigned in respect of blight control.

Spraying with various fixed coppers and Bordeaux caused some reduction in yield in the absence of the blights, the nature of the injury being apparently partly mechanical and partly physiological. Dusting and spraying were of approximately equal value in the control of celery pathogens, but the former method, as with other foliar diseases of vegetables, required greater skill and care than the latter. When the fixed coppers were subjected to temperatures of about 335° F. before application under a steam pressure of 100 lb. with a vapour sprayer, the degree of disease control approximated to that obtained with the usual hydraulic pressure apparatus. The same treatment reacted unfavourably on Bordeaux, the fungicidal action of which was improved, however, at 300° and 75 lb.

In general, the benefit derived from the addition of spreaders and adhesives to the fixed coppers was insufficient, both in respect of enhanced blight control and heavier yields, to justify the continuance of this practice, nor was the admixture of lime of any value for the ends in view. A six-day interval between treatments, which should start about a fortnight after transplanting and continue until just before blanching, was found to give better results than one of four or eight days, the former tending to damage the plants while the latter failed to confer adequate control. The rate of application should be about 150 gals. spray or 40 lb. dust per acre.

Sulphur proved ineffectual alone in combating the blights or significantly augmenting production, but it did give satisfactory results as an adjunct to the fixed coppers, especially tribasic. The average increase in yield from 4–8–100 sprays or 14–20–66 (talc) dusts was 0·8 ton trimmed celery per acre, and the improvement in the foliage rating amounted to 9·5 per cent.

COC-S dust mixtures prepared with various diluents did not differ to any extent in their toxicity to the blights, and there was little to choose between an acid clay

(Cherokee) and an alkaline talc (EM23) as spreaders for COC-S, cuprocide, and tribasic.

In three experiments fermate approached the best copper treatments in disease control and gave substantial yield increases. It should be used at a dosage of 3–100 as a spray or 10–90 with talc as a dust.

WILSON (J. D.) & WILSON (J. J.). **A mosaic-tolerant, pickling-type Cucumber.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 227, pp. 110–113, 3 figs., 1944.

It appears from the results of preliminary tests that the Ohio 31 cucumber, a homozygous segregate of the hybrid Tokio Long Green × National Pickle, offers definite promise as a substitute for the latter in areas where mosaic is a limiting factor. In comparative tests in 1943, over 50 per cent. of the National fruits harvested on 23rd August showed symptoms of the disease, as against only 1·7 per cent. in Ohio 31, the maximum degree of infection manifested by which did not exceed 3 per cent. throughout the trials. Mosaic reached a climax in National during the fortnight following the 23rd August picking, and many of the plants died, but Ohio 31 continued to produce a large proportion of healthy fruits until the final gathering on 18th September.

REICHERT (I.), PALTI (J.), & MINZ (G.). **Field trials for control of downy and powdery mildew of cucumbers. I. On the efficacy of copper compounds.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 96–116, 1 fig., 1944.

Eleven spraying and dusting experiments for the control of cucumber downy and powdery mildews (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [*R.A.M.*, xxiii, p. 253] and *Erysiphe cichoracearum*) were carried out, with the assistance of B. Kapuler, in different parts of the Palestine coastal plain over the six-year period from 1935 to 1941. The success or failure of the treatments was shown to be determined largely by the number given, several materials effectively combating downy mildew when the interval between the applications did not exceed four days, while one of ten days was too long. The best results in the downy mildew trials were given by perenox (cuprous oxide) at a concentration of $\frac{1}{3}$ per cent., the action of 1 per cent. Bordeaux mixture, $\frac{1}{3}$ to $\frac{1}{2}$ per cent. cuprogreen concentrated ($\frac{1}{3}$ to $\frac{1}{2}$ per cent.), and three copper dusts, cupryl, cuprogreen dust, and Bordeaux dust Cooper, being somewhat weaker; powdery mildew yielded only to perenox. Bordeaux mixture not only failed to increase the yield but tended to reduce it, presumably through foliar injury. Yellowing of the leaf margins was caused by perenox, whereas cuprogreen concentrated was innocuous in this respect; the two preparations were comparable in their effects on yield, which they increased by 30 to 70 per cent. The action of the copper dusts was inconsistent in this respect. In one trial during a drought, the addition of 1 per cent. medium white oil to the perenox spray reduced the yield by 35 per cent. The copper treatments, notably perenox, markedly increased the percentage of cucumbers picked during the last part of the fruiting period, an important economic factor in the case of late summer crops. Spraying is cheaper than dusting where labour is obtainable at low cost, but in young fields, requiring only small quantities of material, dusting may be preferable, in spite of the higher initial outlay, especially where foliar damage from spraying is to be anticipated.

REICHERT (I.). **Studies on Mushrooms and other fungi of the forests of Palestine. III. An edible forest truffle, its taxonomy and geography.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 193–204, 1 pl., 2 figs., 1 map, 1944.

A full description is given of a truffle, *Delastriopsis oligosperma*, discovered two years ago in a pine (*Pinus halepensis*) forest near Tel Aviv, the first record of a truffle in Palestine. Another truffle, *Terfezia gennadii*, found in Greece, is re-named *D. gennadii* (Tul.) Reichert comb. nov.

ALLINGTON (W. B.). **Soybean disease investigations.**—*Soybean Dig.*, iv, 11, pp. 60, 65, 1944.

Much of the work hitherto performed by the United States Regional Soybean Laboratory in connexion with its recently inaugurated campaign for the control of diseases through the use of resistant varieties has consisted of phytopathological surveys and inspections of variety nurseries in 24 States. As a result of the 1943 and 1944 investigations, the following diseases (in the order given) are considered to be of actual or potential economic importance: bud blight [*R.A.M.*, xxiv, p. 133], bacterial pustule and bacterial blight [*Xanthomonas phaseoli* var. *sojense* and *Pseudomonas glycinea*], sclerotial blight [*Sclerotium rolfsii*] (confined to the Southern States), pod and stem blight [*Diaporthe phaseolorum* var. *sojae*], downy mildew [*Peronospora manshurica*: ibid., xxii, p. 463], and wildfire. The last-named, a new and alarming development, is caused by a bacterium similar to, or identical with, the agent of tobacco wildfire [*Pseudomonas tabacum*], and was responsible for severe local damage, though the total losses to date from this source are insignificant. The disease was observed in the corn [maize] belt, Louisiana, and Oklahoma.

The present almost exclusive cultivation of the Lincoln soy-bean is deprecated as tending to provide a focus for the particular fungi or their physiologic races to which this variety may in future prove to be susceptible, though so far its performance has been eminently satisfactory.

COLWELL (W. E.). **Fertilizing Soys in North Carolina.**—*Soybean Dig.*, v, 3, pp. 11–12, 2 figs., 1945.

Soy-beans on the dark, highly organic, poorly drained soils of the North Carolina Lower Coastal Plain suffer from potash deficiency [*R.A.M.*, xxii, p. 463], which results in low yields and constitutes a major problem in production in the area under observation. Experiments showed the beneficial effects of top dressings of 50 to 100 lb. muriate of potash per acre prior to the first cultivation. Depending on previous soil amendments, the application of 200 to 300 lb. 0–10–10 or 0–12–12 (or 3–9–9 if following small grain) is recommended. The calcium and magnesium requirements of the soils can be met by the broadcasting of 1,000 lb. dolomitic limestone per acre.

TERVET (I. W.). **The influence of fungi on storage, on seed viability and seedling vigor of Soybeans.**—*Phytopathology*, xxxv, 1, pp. 3–15, 3 figs., 1945.

Species of *Alternaria* were the most frequent occupants of soy-bean seed samples from 19 counties of Minnesota examined in 1942, causing an average of 28·9, 33·2, and 56·3 per cent. infection in the south-east, south-west, and central sections of the State, respectively, followed by *Fusarium* spp. (19, 12·1, and 10), and bacteria (16, 14·3, and 15·2). The incidence of damage by micro-organisms increased in proportion to the extent of frost injury. A comparative investigation of two lots of seed, one from Minnesota (seven samples) and the other from Illinois (six) revealed 18 to 40 per cent. *Alternaria* infection in the former and 0 to 12 per cent. in the latter, the corresponding figures for *Fusarium* being 1 to 11 and 0 to 25 per cent., respectively. The Minnesota lot, with 55 per cent. frost damage, had a moisture content of 6·6 per cent. after two months' storage at 2° C. After a further month in a humidifier at room temperature, which raised the moisture content to 17·6 per cent., the seeds of a sample of the damaged lot were very mouldy, and when 200 were planted on potato dextrose agar, 66 per cent. gave rise to *Aspergillus* spp., as opposed to only 1 per cent. in the low-moisture batch. The high-moisture seeds were exposed to 21 days' adiabatic heating in an apparatus similar to that described by Ramsted and Geddes (*Tech. Bull. Minn. agric. Exp. Sta.* 156, 1942), whereby the temperature was raised from 22° to 46·9°; at the end of this period 98 per cent. were free from internal microflora. Ten lots of beans with a moisture

content of 21·2 per cent. were stored under adiabatic conditions for 19 days, during which period the temperature rose from 29·4° to 77°; samples were analysed for microflora and tested for viability at intervals, 200 seeds being plated and duplicate rows of 100 untreated and 100 arasan-treated seeds planted in a greenhouse at 70°. During the first week of storage, the percentage of sterile seeds decreased from 89 at 22° to 36 at 44·4°, and at the same time the incidence of *Aspergillus* (chiefly *A. glaucus, A. flavus,* and *A. ochraceus* [*R.A.M.*, xiv, p. 671]) infection rose from 5 to 53 per cent.; a decline followed, and by the 15th day at 59·7° the fungi had disappeared. Besides the foregoing, *A. niger, A. fumigatus, Chaetomium* sp., *Cephalothecium* [*Trichothecium*] *roseum, Cunninghamella echinulata, Rhizopus nigricans* [*R. stolonifer*], and *Penicillium* sp. were occasionally present in the seeds. The arasan treatment (maximum adhesion dosage) improved the vigour and increased the stand of the plants. *A. flavus* was apparently the species predominantly concerned in the retardation of seedling growth.

WYCKOFF (R. W. G.). **Some biophysical problems of viruses.**—*Science*, N.S., ci, 2615, pp. 129–136, 1945.

This is a discussion of some of the problems confronting workers engaged on studies connected with (*a*) the concentration, purification, and physico-chemical properties of viruses, (*b*) the specific antigens produced by the animal or plant host in response to infection, and (*c*) the deeper investigation of virus-antibody interaction made possible by purification.

RICHARDS (B. L.) & MUNGER (H. M.). **A rapid method for mechanically transmitting plant viruses.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1010, 1944.

A high-velocity spray stream has given promising results [at the Utah Agricultural Experiment Station] in the transmission of bean virus 4 [southern bean mosaic] and two strains of bean virus 1 [mosaic] to beans, and several strains of cucumber virus 1 [cucumber mosaic] to cucumbers. Diluted viruliferous juice, containing 300-to-400-mesh carborundum, was sprayed on the plants from a distance of 5 to 7 cm. through a suction-feed atomizer made of 5-mm. glass tubing, drawn to 0·5 to 1 mm. orifices, using an air pressure preferably exceeding 30 lb. or a cylinder of liquefied carbon dioxide. The operations were greatly facilitated by the connexion of the atomizer with the source of pressure by means of a cut-off assembly (De Vilbiss No. 633). In large-scale greenhouse and field tests in 1944, the spray-stream technique proved fully equal, if not superior, to the carborundum-rubbing method and enabled the work to be carried out in about a quarter of the time.

Sixty-third Annual Report of the New York State Agricultural Experiment Station.—62 pp., 1945.

In the report from the Division of Plant Pathology (pp. 30–38) J. M. HAMILTON and D. H. PALMITER state that fermate (½–100) is much more effective than sulphur against the cedar-apple [*Gymnosporangium juniperi-virginianae*] and quince [*G. claviceps*] rusts on the Rome Beauty apple and that fermate in combination with wettable sulphur 3–100 (for scab [*Venturia inaequalis*] control) affords good protection. The spray should be applied at the pink, bloom, and petal-fall stages and again ten days later. Sulphur dust containing 4 per cent. fermate was used successfully.

In respect of correctives for soluble phytotoxic materials released from fungicides, it is suggested that air drainage is a factor in russet injury, which is less prevalent at a moderate elevation. During wet weather a mixture of fermate and lead arsenate is a safer spray than a wettable sulphur and lead arsenate for the Delicious and Golden Delicious varieties. For the control of leaf spot [*Coccomyces hiemalis*]

on Montmorency cherries, spray mixtures containing copper were found by J. M. HAMILTON and D. H. PALMITER to be effective, Bordeaux 4–4–100 giving the best protection. Sulphur materials were inadequate. Cupro-K gave a good balance between injury and disease control if used with a sticker. A mixture of micronized sulphur 3–100, cupro-K 1½–100, and lime 1½–100 gave promising results.

The results of field experiments by D. H. PALMITER indicate that a green-tip application of 1 per cent. elgetol to Kieffer pear trees will sufficiently reduce the sooty-blotch fungus, *Gloeodes pomigena*, to permit a commercially clean crop without summer applications of fungicides.

In studies by R. F. SUIT on the stunt disease of blueberries in 1941 about 100 plants of each of the following varieties were planted in muck soil: Pioneer, Concord, Rubel, Jersey, and Rancoras. The results of these and previous plantings indicate that the two first-mentioned varieties are more susceptible than the rest and that the disease increases more rapidly in muck soil.

Under New York conditions Indian Summer, Marcy, and Milton red raspberries may be considered resistant to mosaic. The Morrison black readily becomes diseased, while Evans is less readily attacked than the other black varieties. The Marion purple is not as susceptible as the Sodus or the black raspberries. An effect of the mosaic was that only about half as many tips were put down from infected plants and these produced poor and diseased canes.

In experiments during the past five years on the control of spur blight, *Didymella applanata*, 1 per cent. elgetol gave satisfactory results on the resistant varieties Latham and Chief, and usually on Newburgh. A weaker strength was ineffective and applications were most successful when the buds showed about ½ in. green tissue. The disease was not satisfactorily controlled by this method on the susceptible variety Indian Summer, but an application of fermate, 2 lb. to 100 gals., made when the new shoots were 12 to 15 in. high, gave 70 per cent. control.

G. L. MCNEW reports that in wet, cold soils all varieties of pears are susceptible to seed decay and it is incorrect to suppose that late varieties are immune. Field and greenhouse tests with some 65 varieties and strains show that seeds differ in response to seed decay as much within a variety as within a species. Under not unduly severe conditions Alaska varieties are fairly resistant and those of Thomas Laxton moderately so. Copper compounds tend to be slightly toxic to all varieties under certain soil conditions, but materials such as spergon, arasan, fermate, 2 per cent. ceresan and semesan appear to be safe on all varieties.

In a pea rotation test by the same author, O. A. REINKING, and W. T. SCHROEDER it was found that *F. solani* var. *martii* f. 2 and *Aphanomyces euteiches* were not eliminated by a three-year fallow, though the infestation was reduced. A field plot continuously in peas for four years had about 100 per cent. disease in the early stages of pea development, mainly due to *A. euteiches*.

Good disease control of canning tomatoes was obtained by G. L. MCNEW against early blight [*Alternaria solani*] and *Phytophthora* blight and fruit rot [*P. infestans*] with the insoluble coppers, COCS, microgel, compound A, and yellow cuprocide, as well as with Bordeaux. Two newer materials, 2, 3-dichloronapthoquinone 1, 4 and zinc dimethyl dithiocarbamate offered considerable promise as controls for early blight. In the 1943 tests it was found possible to halve the concentration of either the copper compound or the fermate and yet secure effective control. Fermate alone did not satisfactorily control early blight, *Phytophthora* fruit rot, or *Cladosporium* [*fulvum*] fruit mould, but the copper compounds controlled the first two and also appear to offer some promise with the latter.

Of 30 introduced hop varieties only one, Brewer's Gold, is at present recommended by R. O. MAGIE for commercial production. This is highly resistant both to downy and powdery mildews [*Pseudoperonospora humuli* and *Sphaerotheca humuli*]. Other seedlings developed in the experimental yard may be found equally

satisfactory. The differences in yields between plots of the varieties Late Cluster, Millstate, and Brewer's Gold, in which each plot was restricted over a three-year period to a particular spray mixture, were not significant, so that there was no apparent difference in the deleterious effects of each spray. The mixtures used were Bordeaux 6–4–100 with and without ½ per cent. cottonseed oil, yellow cuprocide 1½–100, and zinc sulphate-lime 6–4–100. Wettable sulphur dust 5–100 was added to each spray mixture. Low-lime Bordeaux appeared equally safe.

The treatment of hop poles and twine with fungicides is practical and effective in reducing downy mildew infection. Stacked poles were sprayed in April with Bordeaux 20–10–100, yellow cuprocide 5–100, tribasic copper sulphate 10–100 or fermate 10–100 at about 35 gals. per acre. The copper materials were better than fermate, reducing the shoot infection by as much as 85 per cent. A similarly good effect was produced on twine. The hop twine was cut to length and soaked in one of the following and dried before use: Bordeaux 7½ per cent. and 2½ per cent. lime, tribasic copper sulphate 6 per cent., and yellow cuprocide 4½ per cent. Organic materials gave less protection.

Seed treatment of Fordhook Lima beans [*Phaseolus lunatus*] is not recommended by H. S. CUNNINGHAM to Long Island growers as a profitable practice. Under conditions of low soil moisture and low rainfall there was some protection but not otherwise. Copper materials hardened the seed coat and stunted the seedling.

In recent years, Long Island potato-growers have suffered considerable loss from seed-piece decay caused by a species of *Fusarium*. Most of the trouble occurs where the grower has cut the seed three or four weeks before planting. It may be spread to healthy pieces by the planter itself. The decay can be largely prevented by treating the whole tubers with yellow oxide of mercury at the rate of 1 lb. to 30 gals. water.

Fifty-fourth Annual Report for the fiscal year ended 30th June, 1944.—*Bull. Wash. St. agric. Exp. Sta.* 455, 168 pp., 1 map, 1944.

In the section of this report [cf. *R.A.M.*, xxii, p. 239] dealing with plant pathology (pp. 64–71), the following items are of special interest. Work by L. K. JONES showed that losses from potato leaf roll could be virtually eliminated in the Ellensburg and Moses Lake areas of Washington State if growers always planted certified seed and practised rotation. M. L. SCHUSTER found that a species of *Fusarium* appeared to be the principal cause of seedling blight of peas. L. K. JONES and E. J. ANDERSON demonstrated that the stem and root rot of peas prevalent in the Palouse is due to *F. solani* f. *pisi*.

C. S. HOLTON states that no new races were identified among the collections of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*] tested [ibid., xxii, p. 239], though the tests included two collections which appeared to represent new races in 1943. Pathogenicity in several artificially produced hybrids was ascertained to be highly stable, and the selective influence of the host was of importance in establishing races produced by hybridization. Two hybrid races were identical in pathogenicity with two recently identified races of *T. caries*. Two hybrid wheat selections from a Rex×Rio cross were highly resistant to all races of bunt, while another, Washington Selection 6, was resistant to all except T–16 and L–8. Other new varieties were resistant to some races. Satisfactory control of bunt was obtained in winter and spring wheats with several compounds; spergon, arasan, Du Bay 1452 C, and No. 53–501–62 were approximately as effective as new improved ceresan.

A number of hybrid selections of wheat proved strongly resistant to two races of flag smut [*Urocystis tritici*] in greenhouse tests, indicating that resistant parent varieties are available for breeding purposes.

Two new races of *Ustilago avenae* and one of *U. levis* [*U. kolleri*] were identified

from seven collections of each species. These are particularly important because they are virulent on the Victoria type of resistance, which has been used in much of the oat breeding programme. The Ventura variety was highly resistant to all except three of the 26 races of *U. avenae* and *U. kolleri* used in the tests. Several selections from the Victoria × Richland cross were highly resistant to collections of the race that attacks Victoria.

G. W. FISCHER found four new races of *U. bullata* [ibid., xxi, p. 294] in collections of head smut of forage grasses. Two were virulent on *Bromus marginatus*. This brings the total number of races to 12, of which four attack mountain brome. A broad range of susceptibility to these 12 races was discovered among 14 selections of mountain brome and Canada wild rye (*Elymus canadensis*). One strain of mountain brome was almost immune, while Canada wild rye was generally more susceptible than mountain brome.

Post-treatment storage of seed for periods ranging up to eight weeks did not influence the effectiveness of five fungicides against *U. bullata* and stripe smut [*U. striiformis*: ibid., xix, p. 351] of Canada wild rye. New improved ceresan gave the best control, while arasan (4 oz. per bush.) was almost equally effective. Copper carbonate was moderately effective against stripe smut, but ineffective against head smut. Overdoses of new improved ceresan were lethal to seeds and seedlings. Thiosan gave excellent smut control, increased stands, and remained uninjurious when used in quantities as large as would adhere to the seed.

J. D. MENZIES obtained good evidence that the leaf-hopper *Platymoideus acutus* is a vector of witches' broom disease of lucerne [ibid., xxiii, p. 3]. Selection No. A–6 continued to show much less infection than any other variety or selection of lucerne under test.

M. L. SCHUSTER found that attack by soil-borne fungi and seed coat injury due to threshing were responsible for poor stands of flax. In seed samples, the amounts of seed with broken coats varied from 10 to 15 per cent. for Zenith and Redwing to 65 to 75 per cent. for Viking and Bison. In isolations from flax seedlings, the fungus most frequently obtained was *Fusarium oxysporum*. Pathogenicity tests showed it to be a virulent parasite. Species of *Penicillium* and *Alternaria* reduced stands through infection of seeds with broken testas. In field and greenhouse tests improved stands resulted from the use of spergon, new improved ceresan, and Du Bay 1205–FF (50 per cent. tetramethyl thiuramdisulphide). Chemical seed treatment gave much greater increases in stands with machine- than hand-threshed seed.

J. D. MENZIES and L. K. JONES state that as most of the virus diseases of stone fruits now present in the Yakima Valley spread slowly in the orchards, a programme providing disease-free propagating material should do much to secure their control. In the case of western X-disease of peach [ibid., xxiii, p. 391], which is capable of rapid spread, eradication of affected trees appears to be a feasible way of restricting infection.

Forty-eighth and forty-ninth Annual Reports of the Montana Agricultural Experiment Station July 1, 1940 to June 30, 1942.—63 pp., 1 map, [? 1942]. [Received March, 1945.]

In the section of these reports dealing with botany and bacteriology (pp. 19–24), H. E. MORRIS states that if elite wheat seed, free or almost free from bunt [*Tilletia caries* and *T. foetida*] is planted, much less bunt will occur in the resulting crop than would otherwise be the case. A soil temperature of about 50° F. and a moisture content of about the optimum for plant growth favour bunt. The best time to plant wheat in Montana in order to avoid infection appears to be from 10th to 20th September, the soil temperature then being favourable for growth and unfavourable for bunt.

For many years past, the annual loss from oat smuts [*Ustilago levis* and *U. kolleri*] in Montana has been approximately 10 per cent., largely, if not entirely, due to lack of seed treatment. Oat seed should be treated with new improved ceresan (½ oz. per bush.) or formaldehyde solution or dust.

When Great Northern beans were first grown locally mosaic caused an estimated loss every year of from 6 to 8 per cent. of the crop. Yields were improved when the practice of sowing certified seed was adopted. Later, some Idaho selections of Great Northern beans which were immune from mosaic were planted, and these have now virtually replaced the former 'field-run' stock of seed. Much progress has been made in the selection of individual plants for freedom from disease and desirable commercial qualities. Several selections have remained free from mosaic for several years, and an intensive test regarding their productiveness is to be made.

During 1941, some 67,000 acres of fertile, irrigated land in Montana were planted to sugar beet. An investigation into seedling diseases of this crop [*Phoma betae*, *Pythium* spp., and *Rhizoctonia* spp.: *R.A.M.*, xxi, p. 510; xxiv, p. 86] showed that seed treatments were only of slight benefit. Beets grown in plots well fertilized with manure in autumn and given a supplementary dressing in spring with nitrogen and phosphate in the form of artificial fertilizers invariably developed only insignificant infection. The lowest amount of seedling disease and the heaviest and largest seedlings resulted in plots given a dressing of 1 part treble superphosphate and 6 parts calcium nitrate or 4 parts ammonium sulphate. It was also found that when calcium nitrate and treble superphosphate were applied, the amount of seedling disease was less than when ammonium sulphate and treble superphosphate were used. Other experiments showed that the lowest amount of seedling diseases occurred when the beets were planted after maize, these diseases developing in increasing amounts after potatoes, oats, lucerne, beans, beet, and continuous fallow. Low soil temperatures (about 50°) and a minimum of moisture (50 per cent. saturation) also favoured freedom from seedling diseases. Even with maximum and optimum soil moistures (85 and 75 per cent. saturation, respectively) seedling diseases were relatively low at low temperatures, and increased considerably with high temperatures. These results stress the importance of planting sugar beets early, while temperatures are still low.

Botany.—*Rep. Ga Exp. Sta., 1943-44*, pp. 53–60, [1944].

This report [cf. *R.A.M.*, xxiii, p. 6] contains, *inter alia*, the following items of phytopathological interest. Germination of Spanish groundnut seed was consistently improved by treatment with 2 per cent. ceresan, arasan, and spergon in that [descending] order. Seed treatment gave no significant increase or decrease in yield per plant, but did increase yields through improved stand. In further trials for the control of groundnut leaf spot [*Cercospora arachidicola* and *C. personata*: loc. cit.], Spanish groundnuts received three applications of sulphur dust or copper-sulphur dust (10–90) or eight of Bordeaux mixture (6–2–100) at intervals of 10 to 15 days, while the later-maturing North Carolina Runner variety received four applications of sulphur or copper-sulphur dust. The average increases in yield of nuts for the Spanish variety were 262, 249, and 177 lb. for sulphur, copper-sulphur, and Bordeaux mixture, respectively. These increases were the lowest obtained in seven years. Over most of the area concerned rainfall was extremely light, and infection was less severe than usual. On North Carolina Runner, sulphur dust and copper-sulphur dust gave increases of 808 and 308 lb., respectively. Other work again indicated that the harvesting of dusted groundnuts may be spread over a longer period than that of undusted nuts.

On p. 17 of this report it is stated that in the course of a fertilizer test *Sclerotium rolfsii* was found attacking Spanish groundnuts due for digging in two weeks' time. The plants were still green, but the roots and nuts were almost destroyed.

A week later, the infected plants died. The North Carolina Runner variety appeared to be unaffected. In the case of the Spanish groundnuts, nitrogen applications reduced the amount of disease in every instance, while nitrogen and potash in combination gave plants that were almost unaffected. By far the heaviest infection occurred in the plots given phosphorus and potash in combination, while the plots without fertilizer came next. Yield of nuts closely followed disease incidence.

A comparative study is being made to determine whether the species of *Guignardia* causing black rot of muscadine [*Vitis rotundifolia*] grape vines is identical with *Guignardia bidwellii*, which causes the disease on bunch grapes [*V. vinifera*: loc. cit.]. Successful greenhouse inoculations demonstrated the pathogenicity of *G. bidwellii* on bunch grapes and of the *G.* species on muscadines, and the genetic connexion of the imperfect states of the fungi associated with leaf-spotting and stem and fruit cankers with the perfect stages on overwintered leaves and berries. Attempts to obtain infection of muscadines with spores of *G. bidwellii* from bunch grapes did not succeed. This, with the fact that cultures from bunch grapes and those from muscadines differ, indicates that the two organisms differ, at least varietally.

While the muscadine fungus causes a considerable amount of leaf-spotting, cankers on the petioles and stems, and some stem-tip and blossom blight, it attacks only a small percentage of the fruit, and infected berries are not often completely destroyed. On vigorous, well-kept muscadine vines the disease does not appear to be of sufficient importance to justify the expense of controlling it. The only means of eradicating the disease would seem to lie in thorough pruning, burning all refuse, and destroying any wild muscadine vines in the vicinity.

Macrophomina phaseoli and *S. rolfsii* [loc. cit.] were again the chief fungi associated with root rot of snap beans [*Phaseolus vulgaris*]. *M. phaseoli* produces a charcoal rot of seedling beans and root rot and stem lesions of older plants. Very young seedlings affected by charcoal rot are entirely blackened and collapsed; only the *S. bataticola* stage is found on such seedlings. If, however, enough woody tissue has developed to hold the plant erect after its death, pycnidia form on the above-ground parts of the lesions. After the death of older plants killed by root infection, the fungus spreads over the whole plant, producing the ashy stem-blight phase of the disease. Numerous pycnidia over the whole surface of the plant raise the cuticle, causing the stems to appear pale grey. Ashy stem blight may appear independently of root rot on plants from blossoming until maturity. Reddish-brown discolorations appear on the stems. Parts of the stem above the point of infection die and are covered by pycnidia. Leaves are similarly infected, and the fungus often enters the stem from diseased leaves. Pycnidia are produced on the leaves also. All isolates from snap bean, whether pycnidia were present or not, and isolates from the two common bean-field weeds, coffee weed [*Cassia* sp.] and *Lactuca scariola*, produced pycnidia in culture on sterile bean stems.

Diaporthe sojae [ibid., xix, p. 256] was found in one locality on snap bean and in another on cowpea, soybean, and Lima bean [*P. lunatus*]. Perithecia developed on overwintered stems of all four hosts.

Some hybrid peas gave earlier and better growth and considerably more seed than the Austrian Winter variety, which was used as a control. This variety became severely affected by root rot [largely *Aphanomyces euteiches*: ibid., xx, p. 211], but some of the hybrids showed considerable tolerance towards the disease.

The vetch leaf spot disease previously reported as due to a *Botrytis* [of the *B. cinerea* group: ibid., xxiii, p. 347] was more prevalent and severe in one locality than in the past, particularly on *Vicia grandiflora*, though all the varieties grown were more or less affected. The Smooth and Purple varieties appeared to be most resistant. Rotation should keep the disease down, but the fungus is widespread

and attacks many other plants, including lupins. Lupin diseases studied include anthracnose (*Glomerella cingulata*), stem rot (*B. cinerea*), root rots (*Rhizoctonia* [*Corticium*] *solani*, *Pythium* sp., *Fusarium oxysporum* f. *radicis-lupini*, *F. solani* f. *lupini*, and *F. moniliforme* [*Gibberella fujikuroi*], and foot rot (*S. rolfsii*).

Bacterial wilt of *Lespedeza* [ibid., xix, p. 543] is now known to occur in Georgia.

C[ARDENAS] (M.). **Algunas enfermedades criptogámicas y entomológicas constatadas en Bolivia de 1942–1944.** [Some cryptogamic and entomological diseases observed in Bolivia from 1942 to 1944.]—*Rev. Agric., Cochabamba*, ii, 2, pp. 39–40, 1944.

During the two-year period under review, the following diseases, among others, were observed on economic or ornamental crops in Bolivia: *Taphrina deformans* on peach, *Venturia inequalis* on apple, *Erysiphe cichoracearum* on chicory, *E. polygoni* on American tomatoes and *Dahlia*, *Puccinia glumarum* on wheat, and *Uromyces caryophyllinus* on carnation.

HOERNER (G. R.). **Crown gall of Hops.**—*Plant Dis. Reptr*, xxix, 4, pp. 98–110, 1945. [Mimeographed.]

Since the author's account of the economic importance of *Agrobacterium* [*Bacterium*] *tumefaciens* on hops [*R.A.M.*, xiii, p. 727] much work has been done respecting the host range of the pathogen. Inoculation by means of a hypodermic syringe, using a suspension of the organism in water, was found to be a satisfactory method of testing. The results are tabulated. Of 2,958 inoculations made on 210 species, those of 157, representing 71 genera and 37 families, were successful. These included commercially important crops, such as cauliflower, turnip, radish, melon, peas, hemp, tomato, tobacco, carrot, and potato. It is noteworthy that in the Cactaceae the tissue adjacent to the punctures was usually killed and the process of infection checked.

HODGSON (R.), RIKER (A. J.), & PETERSON (W. H.). **Polysaccharide production by virulent and attenuated crown-gall bacteria.**—*J. biol. Chem.*, clviii, 1, pp. 89–100, 1945.

The isolation, purification, and properties of several polysaccharide preparations from cultures of virulent and attenuated strains of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xxi, p. 409] are described. More polysaccharide was obtained from virulent than from attenuated cultures. The polysaccharide from the latter appears to be identical with the low molecular-weight glucosan produced by the former. Glucosan evolved by the virulent strain from sucrose, glucose, and fructose varied in yield but possessed the same properties. Under the experimental conditions employed the glucosan was not readily utilized by the organism as a source of carbohydrate.

COLEMAN (MADELINE F.) & REID (J. J.). **A serological study of Alcaligenes radiobacter and Phytomonas tumefaciens in the 'M' and 'S' phases.**—*J. Bact.*, xlix, 2, pp. 187–192, 1945.

A study was made of the serological relationship between *Alcaligenes* [*Bacterium*] *radiobacter* and *Phytomonas* [*Bact.*] *tumefaciens* [*R.A.M.*, xix, p. 461; xxiii, p. 378] with the aid of the agglutination and agglutinin absorption techniques described by Dawson and Sia (*J. exp. Med.*, liv, pp. 681–700, 1931) and Krumwiede *et al.* (*J. Immunol.*, x, pp. 55–239, 1925), respectively. Seven strains of the former organism (non-pathogenic to tomato) were used and two of the latter, which caused virulent infection on the same host. The bacteria were found to differ serologically in the 'M' phase, but were antigenically identical in the 'S', as indicated by complete reciprocal agglutinin absorption. The data are interpreted

as an indication that *Bact. radiobacter* and *Bact. tumefaciens* are alternative aspects of a single species, which in their normal 'M' phase bear the same mutual relation as do the various types of *Pneumococcus*.

GARCÉS (C.). **Informe sobre Cacao.** [Report on Cacao.]—*Rev. Fac. Agron., Medellín*, v, 21, pp. 249–262, 1944.

This report (dated 15th December, 1939) on cacao in the Garzón district, Department of Huila, Colombia, contains the following information on diseases [cf. *R.A.M.*, xxi, p. 7]. *Phytophthora faberi* [*P. palmivora*] is widespread and responsible for heavy losses, and a further complication lies in its frequent occurrence on the trunk and branches in a masked form, precluding its recognition until an advanced stage is reached. The only effective means of control is the excision of the infected tissue and the application to the wound of Bordeaux paste or arbosan. It is absolutely necessary that the cuts should extend to a depth of at least 2 cm. beyond the visible zone of infection in order to prevent the further penetration of the fungus into the underlying tissues.

A species of *Sphaeronema* is associated, invariably in the company of Scolytid beetles, with a yellow rot, the same fungus having been reported as the agent of a similar disease in Ecuador. The dark-coloured lesions on the trunk, resembling those produced by *P. palmivora*, exude throughout the winter an abundance of watery, yellow-reddish, malodorous liquid. On the removal of the cortex, the woody tissues are found to be largely involved in a yellow discoloration interspersed with black and yellow patches.

A progressive decline of the aerial parts of the tree and a black discoloration of the roots are tentatively attributed to a species of *Rosellinia* [ibid., xvi, p. 202]. The best method of control is the isolation of the diseased and immediately adjacent healthy trees by means of trenches 40 cm. in width by 60 cm. in depth prior to their eradication and burning *in situ*. The cavities left by the uprooting of the trees should be liberally sprinkled with lime and the ground allowed to rest for at least a year before replanting.

Monilia [*roreri*: ibid., xxi, p. 8] presents a problem of extreme gravity, being responsible for immense losses (up to 100 and averaging 30 per cent. of the pods). The fungus has probably been introduced into Colombia from the contiguous areas of the Republic of Ecuador, where it is indigenous [ibid., xvii, p. 801]. Infected pods are utterly destroyed, and such is the reproductive activity of the pathogen that it constitutes a perpetual source of inoculum in a plantation. Besides the common form of the 'watery rot' there is an insidious type of the disease causing abortion of the pods and total failure of the crop. Control measures should include environmental modifications, such as pruning of the cacao and shade trees to regulate humidity and admit sufficient light; eradication of old, diseased trees to provide space and facilitate ventilation; and the installation of drains to carry off excess water. Bordeaux mixture 4–4–50 should be applied to the young pods, the number of treatments being dictated by local conditions. Infected pods should be collected and buried *in situ*, with an admixture of lime, to prevent the propagation of the fungus by means of its spores.

Of minor importance are black pod rot [? *Colletotrichum* sp.], brown rot [*Botryodiplodia theobromae*], and die-back, reference to which was made in the author's previous report [ibid., xxi, p. 7].

STAKMAN (E. C.), LEVINE (M. N.), & LOEGERING (W. Q.). **Identification of physiologic races of Puccinia graminis tritici.**—Issued by U.S. Dep. Agric., B.E.P.Q., 27 pp., 1 fig., 1944. [Mimeographed.]

The greater part of this useful publication is devoted to a tabulated summary of the reactions of 12 varieties of wheat to 189 races of *Puccinia graminis tritici*

and a key for identifying these races based on whether the reactions on the differential hosts are classed as 'resistant' (no uredia or uredia minute to small), 'susceptible' (uredia medium to large), or 'mesothetic' (uredia variable). In addition there are notes on the differential varieties, the techniques for the collection and preservation of the rust samples, the inoculation and management of the test plants, and the use of the key and tables. The identification of mixtures of races in one collection is also touched on.

BAKER (G. A.) & BRIGGS (F. N.). **Wheat bunt field trials.**—*J. Amer. Soc. Agron.*, xxxvii, 2, pp. 127–133, 1 graph, 1945.

In studying the inheritance of resistance of wheat to bunt (*Tilletia tritici*) [*T. caries*; *R.A.M.*, xiii, p. 20; xx, p. 457] it is necessary to grow F_3 progenies from F_2 plants in order to determine the genotype of the latter, since all susceptible plants do not usually show the disease under conditions generally prevailing. Furthermore, some heterozygous resistant and occasionally some homozygous resistant plants become diseased. When two or more factors are involved in resistance it may be difficult to recognize these genotypes and genetical analysis may be unsatisfactory.

At the California Agricultural Experiment Station a mathematical model of wheat bunt field trials has been constructed which should be of aid in interpreting complex hybrids in that the nature of variances will be better understood. The mean and spread of the heterozygous plants cannot be observed, but may be calculated because the means and variances of the percentages for the homozygous and segregating rows can be observed, and it can be assumed that the probabilities of infection for different types of plants are perfectly correlated as between rows.

ROSEN (H. R.). **Breeding Oats to combine resistance to race 45 and other races of crown rust common in Arkansas.**—*Phytopathology*, xxxv, 2, pp. 143–144, 1945.

In 1944, for the first time, race 45 of crown rust (*Puccinia coronata*) [*R.A.M.*, xviii, p. 242] attacked spring-planted Bond oats with such severity as to constitute a distinct hazard to future crops, besides reducing yields considerably in the current season. Infection appeared shortly after the booting, and by the time of the early milk stage had covered at least 30 per cent. of the leaf area. The Mutica Ukraina variety, previously reported to be highly resistant to races 33 and 34, was found to be virtually immune from race 45, and one of the hybrids (674 (2)–39 f), arising from crosses between it and R3–II showed a marked capacity to withstand not only 45 but also 1, 7, and several others of less frequent occurrence in the State. R3–II in its turn was derived from a cross between Coker 32–I and (Victoria × Richland C. I. 3313), so that the hybrid possesses two different sources of crown rust resistance, Victoria and Mutica Ukraina, and two of resistance to smut [*Ustilago avenae* and *U. kolleri*], Coker 32–I and Victoria.

PATEL (N. M.). **Inheritance of loose smut reaction in crosses with Victoria and smut resistant (Cornell)–6 under field conditions of growth and infection.**—*Abstr. Thes. Cornell Univ.*, 1942, pp. 378–379, 1943.

In investigations into loose smut (*Ustilago avenae*) inheritance in oats, it was found that Victoria and Rust Resistant (Cornell)–6 were highly resistant, Upright moderately susceptible, and Canadian, Ithacan, Victor, Lenroc, Series 1060 Lot–44, and Strain No. 428a 3–49 very susceptible. The inoculum used was a mixture of the two physiologic races of the fungus prevalent in New York, Reed's 21, which is the Ithaca race, and Reed's 1 (Missouri).

In all crosses resistance was dominant over susceptibility. A mono-Mendelian ratio of 3 resistant : 1 susceptible was observed in the F_2 of ten crosses. A duplicate

factor ratio of 15 resistant : 1 susceptible was observed in the cross Series 1060 Lot–44 × Smut Resistant (Cornell)–6 in the F_2. In the F_3, some families bred true for smut resistance, some segregated into 3 resistant : 1 susceptible, and some into 15 resistant : 1 susceptible or smutted. These F_3 families gave a distribution of 7 : 4 : 4, respectively. In the cross between the black-glumed Victor and the reddish-glumed Victoria the loose smut reaction segregated independently of the lemma coloration.

Canadian, Victor, Lenroc, Upright, and Ithacan each differed from Victoria in one gene for smut reaction and carried the recessive allele for smut reaction in its genotype, predisposing it to develop smut upon infection. Victoria carried the dominant homologous gene, enabling it to resist invasion by the smut. Lenroc, Strain No. 428a 3–49, and Upright each differed from Smut Resistant (Cornell)–6 in one gene and carried the dominant gene for smut reaction, enabling it to resist invasion by the mycelium of *U. avenae*, which usually takes place in the early seedling stage. Series 1060 Lot–44 carried two pairs of independently segregating genes in a recessive condition as compared with Smut Resistant (Cornell)–6, which bore in its genotype two dominant genes allelic to the two carried by Series 1060 Lot–44. All these genes were equally effective in producing the smut reaction.

Atkinson (R. E.). **A new mosaic chlorosis of Oats in the Carolinas.**—*Plant Dis. Reptr*, xxix, 3, pp. 86–89, 1945. [Mimeographed.]

First noticed in 1944, a mosaic of oats similar in pattern to those induced by virus in wheat and sugar-cane has appeared in North and South Carolina. The mottling appears conspicuously in spring as cream-coloured streaks, usually ten or more times as long as wide, chiefly on the basal part of the leaf but extending over the whole lamina and sheath. Dwarfing is not so extreme as to produce a 'rosette' appearance, but in some species rolling imparts a resemblance to wild garlic leaves, as in wheat mosaic. Sometimes only the lower leaves are affected and there are indications of recovery or 'growing-out'. The severity of the disease is particularly marked in genetically pure selections, in which it may cause a 50 per cent. or more reduction of yield. The following varieties have been found resistant: Coker's Victorgrain 43–1, 4, 43–5, 43–11, and 43–12, Coker's Fulgrain 6, Fulwin, Wood's Victorgrain 182, and Fulgrain 304, while of other species of *Avena*, *A. fatua*, *A. brevis*, *A. wiestii*, and particularly *A. barbata* are resistant. The varieties Selina, Letoria, and Stanton recommended for the Carolinas are all attacked. An even more important source of loss than the mosaic disease itself is that it undoubtedly predisposes oats to winter-killing and *Helminthosporium* foot rot.

Deva Rajan (M. R.) & Aiyappa (K. M.). **Leaf-fall and fruit-rot disease of Oranges.**—*Indian Fmg*, v, 11, pp. 512–513, 1945.

Heavy losses are caused over half the area under oranges, conservatively estimated at 10,000 acres, in the Coorg district of Madras, by *Phytophthora palmivora* [*R.A.M.*, xx, p. 401], which attacks trees of all ages up to 100 years, occurs in every type of soil and at altitudes of up to 4,000 ft. above sea-level, and is unaffected by atmospheric humidity within the limits of a rainfall ranging from 40 to 200 in. per annum. The first symptom, excessive defoliation spreading from the lower branches upwards, appears suddenly and develops with extreme rapidity with the onset of the monsoon at the end of May or early in June. The diseased leaves bear dark brownish, watery-looking patches, and similar lesions are later found on the fruits, which decay and drop. An objectionable odour is emitted by both foliage and fruits and is diffused from two or three diseased trees over an entire orchard. The malady, though not immediately fatal, is liable to recur in the next rainy season and probably leads to the premature death of the trees

through weakness. A single application of 1 per cent. Bordeaux mixture will prevent the onset of the disease, but it may have to be repeated if the symptoms are observed in August or September. This method of control originally applied by the Department of Agriculture, Madras Province, to infected orchards in the Malabar district, was found to be equally effective, as well as economically profitable, in the region served by the Orange Research Scheme, Coorg.

MILLER (E. V.), WINSTON (J. R.), & MECKSTROTH (G. A.). **The use of HCHO and Na *o*-phenylphenoxide in the control of decay in Citrus fruits.**—*Citrus Ind.*, xxv, 10, pp. 3, 15, 18, 1944. [Abs. in *Chem. Abstr*, xxxix, 5, p. 996, 1945.]

Sodium ortho-phenylphenoxide (dowicide A) effectively controlled citrus fruit decay but injured the rinds, a drawback which was overcome by the addition of one part by weight of commercial formaldehyde (37 per cent.) to 4·5 parts of the fungicide. The mixture can be used both in aqueous solution and wax emulsions, but in the latter case it should be added to the water diluent, not to the wax itself. The treatment was successful only when the mixture was applied as a warm flood spray at concentrations of $1\frac{1}{4}$ to 2 per cent.

HARVEY (J. V.). **Fungi associated with decline of Avocado and Citrus in California (III).**—*Plant Dis. Reptr*, xxix, 4, pp. 110–113, 1945. [Mimeographed.]

Records are given of the incidence of fungi from the roots of declining avocado and citrus trees in California in 1944 [*R.A.M.*, xxiii, p. 454]. *Phytophthora cinnamomi* [ibid., xxi, p. 149] was found in 55 per cent. of the declining avocado trees examined, whereas only 20 per cent. of non-declining trees yielded this fungus; these were almost all from decline areas, and in some cases developed the disease later. The fungus, which is prevalent in moist, badly drained soil, may be considered as of primary importance in the decline of avocado. *Pythium vexans* is also frequent in declining avocado groves (on 203 out of 436 declining trees compared with 143 out of 442 healthy) and, though probably of less importance, is worthy of further investigation. In citrus, especially lemon and Valencia orange, *P. ultimum* occurs frequently enough to deserve investigation also, namely, on 45 out of 83 declining trees of the former and 63 out of 121 of the latter, compared with 14 out of 42 and 34 out of 107 healthy, respectively. *Phytophthora citrophthora* seems to be unrelated to decline in citrus, but is a good 'index fungus' in foot rot.

EZEKIEL (W. N.). **Synthetic culture media for the root-rot fungus Phymatotrichum omnivorum.**—*Phytopathology*, xxxv, 3, pp. 159–161, 1945.

For convenient reference, and to avoid the necessity for continuous re-description of the synthetic media in common use for the culture of the cotton root-rot fungus, *Phymatotrichum omnivorum*, five important formulae (three liquid and two solid) are presented.

BRUMPT (E.). **Les Entomophthorées parasites des Moustiques. Étude critique. Recherches personelles.** [The Entomophthoreae parasitic on Mosquitoes. Critical study. Personal investigations.]—*Ann. Parasit. hum. comp.*, xviii, pp. 112–144, 15 figs., 1941. [Received April, 1945.]

From vats filled with macerated leaves and other organic products and water, with or without an admixture of sodium arsenite, at the Richelieu Experiment Station, Indre-et-Loire, 105 specimens of *Culex pipiens* (of which 101 were females) and one female of *Theobaldia annulata* destroyed by a species of *Empusa* were collected between 29th August and 30th September, 1940, this number representing some 5 per cent. of the total mosquito population visiting the artificial laying-grounds. Six members of the Entomophthoreae have been recorded in the relevant literature on mosquitoes, namely *Empusa culicis* Braun, 1855,

Entomophthora sphaerosperma Fres., 1856, *Empusa conglomerata* Sorokin, 1876 (non Thaxter, 1888), *E. rhizospora* Thaxter, 1888, *E. henria* Molliard, 1918, and *E. schroeteri* Brumpt, 1940 (*E. rimosa* Schroeter non Sorokin, 1876), renamed in *C. R. Acad. Sci., Paris*, ccxi, p. 483, 1940.

The species isolated from the Richelieu insects is in almost complete agreement with *E. conglomerata*. Only one (0·28 per cent.) of the numerous oral and cutaneous inoculation experiments on 355 larvae and adults was successful (in the former stage), and projects for the large-scale dissemination of entomophytic fungi are considered to be futile, having regard to the dependence of epizootics on climatic factors outside human control.

DROBOTKO (V. G.). **Stachybotryotoxicosis, a new disease of Horses and Humans.**—*Amer. Rev. Soviet Med.*, ii, 3, pp. 238–242, 1945.

The author summarizes the available information on the etiology, symptomatology, and modes of infection of stachybotryotoxicosis (*Stachybotrys alternans*), a disease of horses in the Ukraine [*R.A.M.*, xxii, p. 138], which occasionally affects humans coming into contact with infected hay, the original habitat of the pathogen.

CONANT (N. F.), MARTIN (D. S.), SMITH (D. T.), BAKER (R. D.), & CALLAWAY (J. L.). **Manual of clinical mycology.**—xiii+348 pp., 137 figs., 11 maps, Philadelphia & London, W. B. Saunders Company, 1945. 17*s.* 6*d.*

This volume is one of a series produced under the auspices of the Division of Medical Sciences of the National Research Council to supply the medical departments of the United States Army and Navy with succinct presentations of essential information in the field of military medicine. Knowledge of fungous infections is of paramount importance to medical officers at the present juncture, when thousands of men in the Forces are engaged in the field in tropical regions where mycoses abound, and the same applies to the doctors at home under whose care returning soldiers will be placed. With these objects in view, the manual comprises clear-cut clinical descriptions of the systemic and superficial mycoses, elucidations of problems of nomenclature and differential diagnosis, and simplified and practicable classifications and methods. The maps showing the geographical distribution of a number of the diseases are a very useful feature of the treatise.

BRIERLEY (P.) & SMITH (F. F.). **Additional specimens of Lilium susceptible to Lily-rosette virus.**—*Phytopathology*, xxxv, 2, pp. 129–131, 1 fig., 1945.

As a result of inoculation experiments with the rosette virus isolated from Florida-grown Easter lilies (*Lilium longiflorum*) [*R.A.M.*, xxiii, p. 439], using *Aphis gossypii* as the vector [ibid., xix, p. 517], the following species were found to develop some or all of the characteristic symptoms of the disease, namely, plant dwarfing and curling, foliar yellowing and reddening, and dwarfing or absence of flowers: *L. elegans*, *L. formosanum*, *L. henryi*, *L. leucanthum*, *L. longiflorum*, *L. myriophyllum* var. *superbum*, *L. regale*, *L. sargentiae*, *L. speciosum*, and *L. umbellatum*. In *L. formosanum*, *L. sargentiae*, and *L. umbellatum* the pathological changes became evident about three weeks after infection and the disease could be diagnosed with a fair degree of accuracy, but in none of the other species tested were the symptoms as clear-cut as in *L. longiflorum* and confusion with the effects of root injury or poor cultural conditions might well be expected to occur in the field. In such cases, moreover, the virus may be harboured and disseminated by plants of superficially normal aspect serving as unsuspected reservoirs of inoculum.

IMLE (E. P.). **The basal rot disease of Lilies.**—*Abstr. Thes. Cornell Univ.*, 1942, pp. 370–372, 1943.

Basal rot of lilies, shown by the writer to be present in Japan, Holland, France,

the Pacific Northwest area of the United States, the Midwest, and the Atlantic seaboard States, is stated to have caused a loss of 70,000 bulbs in a single planting of *Lilium testaceum*. Up to 61 per cent. reduction of yield resulted in susceptible species, while losses of 31 per cent. occurred in storage.

The disease was shown to be due to a fungus referred to *Fusarium oxysporum* f. *lilii* [*R.A.M.*, xxiv, p. 149]. The morphological characters of culture No. 176 (*L. candidum*, Michigan), with which those of the other pathogenic isolates closely agreed, are as follows: average of 315 normal macroconidia, 37·9 by 4·4μ, mostly 3-septate; 1 to 16 per cent. 4-septate, measuring 43·6 by 4·5μ. They are pointed towards the apex, smaller in diameter above than below the middle, and pedicellate. The microconidia are rare to 5 per cent. of the total number of spores, the non-septate measuring 8 by 2·7μ, and the 1-septate 16 by 3·8μ. The aerial mycelium is moderately abundant. The macroconidial masses are light salmon-orange and are produced beneath the aerial mycelium in pionnotes. Bluish sclerotia are present. The chlamydospores are terminal and intercalary in hyphae and conidia and measure 8 to 11μ in length. Mature cultures are white to vinaceous on barley heads, white to La France-pink, geranium-pink or scarlet-red on rice, and white to capucine-buff or pale vinaceous-pink on sweet clover stems and potato dextrose agar.

The following species and hybrids were found to be highly resistant: *L. hansonii*, *L. sargentiae*, and *L. maximowiczii*. The fungus does not attack common bulbous plants other than lily, except crocus.

Distribution of the pathogen takes place chiefly by means of diseased bulbs. The pathogen is disseminated by spores, infected plant parts, and infected tools, soil, and equipment. Spores are abundantly present in packing houses and crates, and the fungus was also found repeatedly in the dry, brown tissue at the edge of scales fallen from diseased bulbs. Such scales are commonly used for propagation.

BAINES (R. C.). **Verticillium wilt and die-back of Viburnum.**—*Phytopathology*, xxxv, 2, pp. 145–147, 1945.

Verticillium albo-atrum was isolated from *Viburnum lantana* and *V. tomentosum* suffering from an unthrifty condition and die-back, frequently culminating in death, which was first observed at Lafayette, Indiana, in 1940. In addition to the characteristic external symptoms produced by the fungus, brown sectors or continuous bands of discoloured wood were observed, frequently extending from the base to the tip of infected canes. Inoculation experiments on 2-ft. high *V. lantana* shrubs with maize meal-sand cultures of the pathogen from *Viburnum*, *Chrysanthemum*, and peppermint introduced into the soil gave positive results and the results of additional inoculations on other hosts are tentatively interpreted as indicative of variation in the pathogenicity of the cultures under investigation comparable to that reported by Tilford and Runnels in connexion with *Chrysanthemum* wilt (*Bull. Ohio agric. Exp. Sta.* 630, 1942) [cf. *R.A.M.*, xxi, p. 203].

KREITLOW (K. W.). **Ustilago striaeformis. III. A further study of factors that influence after-ripening of chlamydospores from Poa pratensis.**—*Phytopathology*, xxxv, 3, pp. 152–158, 1945.

Chlamydospores of stripe smut (*Ustilago striiformis*) from *Poa pratensis* [*R.A.M.*, xxiii, p. 110] were after-ripened in host tissue free from contaminants, becoming germinable in 10 to 25 days, occasionally longer. After washing free of host tissue, other samples were after-ripened on bits of filter paper incubated at 35° C. in a moist chamber. Treatment of the chlamydospores in a Waring blender [as used by Andrus: ibid., xx, p. 546] for various periods from 15 seconds to five minutes expedited after-ripening and increased germinability from 75 to 90 per

cent. Fresh chlamydospores stored at 5° for 60 days and then transferred to 35° took longer (10 to 20 days) to after-ripen than a comparable batch maintained at 25° (three to five days). The spores should be in actual contact with water for successful after-ripening, those incubated in a saturated atmosphere requiring longer to germinate, while dry storage altogether inhibited the process of maturation.

COOLEY (J. S.). **Susceptibility to black root rot of Apple trees having various root and top combinations.**—*Phytopathology*, xxxv, 2, pp. 142–143, 1945.

Continuing his studies in Maryland on the susceptibility of apple to *Xylaria mali* [*R.A.M.*, xxii, p. 69], the writer determined the reactions of trees two years from the graft, either own-rooted or worked on an own-rooted tree of known variety, inoculation being carried out annually for four years from 1937. Since the degree of susceptibility was not appreciably influenced by the top, the several root and top combinations were grouped according to the 21 root varieties. The tabulated results show that while there were some differences in susceptibility, none of the tested experimental varieties is outstandingly resistant to *X. mali*.

COOLEY (J. S.). **The effect of manure and of commercial fertilizer on susceptibility of young Apple trees to black root rot.**—*Phytopathology*, xxxv, 3, pp. 207–209, 1945.

At the Plant Industry Station, Beltsville, Maryland, no consistent or outstanding differences were observed in the reaction to black root rot (*Xylaria mali*) of nursery Wealthy and Early Ripe apple trees [see preceding abstract] supplied with (*a*) manure (14 tons per acre) or (*b*) commercial fertilizer in seven combinations of 107 lb. each of muriate of potash and acid phosphate and 324 lb. sodium nitrate per acre over a period of seven years for the former and four for the latter treatment.

HILDEBRAND (E. M.). **Pithy cherry disease of Sour Cherry in New York.**—*Plant Dis. Reptr*, xxix, 4, pp. 116–117, 1945. [Mimeographed.]

'Pithy cherry', a name given by growers to a new disease of Montmorency cherry fruit in New York, is characterized by the appearance on the ripe fruit of several depressed, dark, corky lesions beneath the skin and sometimes reaching to the pith. At maturity the spots are nearly black, the appearance of the fruit rendering it unmarketable. Up to 12 per cent. of the trees may be involved in different rows in affected orchards and the percentage of diseased fruit on individual trees ranged up to 50 per cent. No micro-organisms have been found associated with the disorder. A virus was suspected to be the agent, but it was found that grafts from cherry trees infected with the 'pithy' disease recovered when grown on healthy trees, though they carried the ring-spot virus. In an experiment in 1943–4 it was further shown that the symptoms of 'pithy cherry' disappeared after the application of 5 oz. borax per tree, whereas the untreated trees showed slight symptoms, so it is thought that the disease may be of physiogenic origin and due to boron deficiency, though proof of this is not yet established.

MRAK (E. M.). **Microbiological deterioration in dried and dehydrated fruits.**—*Canner*, c, 17, p. 22, 1945.

Spoilage of unsulphured dried fruits is mostly due to yeasts belonging to the genera *Zygosaccharomyces*, *Hanseniaspora*, *Kloeckera*, and *Saccharomyces* [cf. *R.A.M.*, xxii, p. 143]. In prunes, contamination begins in the orchard, but moulds and yeasts are killed during dehydration, recontamination occurring in subsequent handling. As they pass over the grader, prunes pick up micro-organisms from the water used to swab down grader screens. Considerable losses occur, and

undesirable changes take place within the fruit. This might be remedied by sanitary handling immediately the fruit leaves the dehydrator. Contamination of sun-dried fruit is even worse, the organisms not being killed during drying.

With figs, most of the deterioration results from contamination in the orchard. Mites which enter the young fig carry the spores of the *Aspergillus* that causes smut [*A. niger*: ibid., xiii, p. 42]. Spores of *Fusarium* and other fungi and yeast are carried to some figs by insects in the caprification process. Yeast souring results to some extent from high humidity during the ripening season. External yeast growth may occur in the dry yards or with other handling.

With dates, mould or, more commonly, yeast growth occurs when humidity is high in the ripening season. Dehydration and heat treatment are inadvisable as they invert the sucrose and cause darkening.

The first step in control must take place in the orchard. Within the packing plant, pasteurization is not applicable to bulk packages. Packing at low moisture content does not permit packaging the best possible product. Fumigation with ethylene oxide or mixtures of this and other chemicals gives completely satisfactory results; it permits packaging at suitable moisture levels and eliminates the necessity for heat treatment.

LEWCOCK (H. K.). **Soft rot (winter blister) disease of Pineapples.**—*Qd agric. J.*, lx, 1, pp. 42–45, 2 figs., 1945.

An account is given in semi-popular terms of the symptoms, causal organism, mode and development of infection, and control of soft rot or water blister disease of pineapple caused by *Ceratostomella paradoxa* [*R.A.M.*, xi, p. 193; xx, p. 374].

THOMAS (C. A.). **The effect of some commercial fungicide dust fillers on plant growth.**—*Proc. La Acad. Sci.*, vii, pp. 16–17, 1942. [Received April, 1945.]

Investigations were carried out at Baton Rouge, Louisiana, to determine the effects on plant growth of the fungicide dust fillers, bentonite clay, eastern magnesia talc, and pyrax (Tennessee Copper Company). Peas and beans germinated in a filtrate containing one part bentonite to 50 of water developed a brown discoloration of the roots, while the former, grown directly in the filler, were stunted and the plants wilted within ten days. In comparable tests with the other two diluents no toxic effects were observed, and none of the substances proved injurious when dusted on clover and lucerne plants in the greenhouse.

Notes contributed by the Biological Branch.—Sterilization of seed bed soil.—*Agric. Gaz. N.S.W.*, lvi, 2, pp. 71–73, 2 figs., 1945.

Brief, popular notes are given on the sterilization of seed-bed soil by heat (baking, steaming, hot water, and surface burning) and by chemical treatment (formalin, carbon bisulphide, and chloropicrin).

Answers to growers.—*John Innes Bull.* 1, 60 pp., 15 figs., [1945].

On pp. 7–8 of this bulletin, W. J. C. L[AWRENCE], dealing with the question whether composting will destroy a virus, states that in 1943 a compost was made from out-of-door tomato plants severely affected by tobacco mosaic, cucumber mosaic, and possibly other viruses. Ten Harbinger tomato plants raised in J.I. [John Innes] seed compost were potted on 11th May, 1944, into (*a*) the pure tomato compost, and (*b*) J.I.P. [John Innes potting compost] for comparison. Growth in the pure compost was unexpectedly good, though, naturally, less satisfactory than in J.I.P. No sign of virus disease was seen at any time on the leaves of either the clean or the virus-composted plants. Subsequent examination showed that five plants carried the tobacco mosaic virus, the roots, though not the tops,

evidently having become infected from the compost. When, in a further experiment, tomato plants were grown in the open in ground treated with (*a*) virus-infected tomato compost and (*b*) horse manure, both at 20 tons per acre, the health and yield of the plants were equally good in both plots.

M. B. C[RANE] (pp. 51–53) deals with two abnormalities of Lord Lambourne apples, (1) 'rubbery wood', in which the branches are soft and lack rigidity, and (2) 'chat fruit', in which the fruits are very small. These defects generally occur independently, but may be present on the same tree. On one estate in Hampshire the author saw established Excelsior trees top-grafted with Lambourne. They were a mass of rubbery growth. The grafts had been taken from healthy Lambourne trees grown on the estate. Thus, the rubbery abnormality appears to result from grafting. On the same estate, a large established Redcoat Grieve tree was also top-worked with Lambourne. This developed normal growth, but the fruits were all 'chats'. The scions were from normal trees. It appears, therefore, that the 'chat fruit' abnormality also results from grafting. As regards the normal grafting of healthy scions of Lord Lambourne directly on to rootstocks, it seems probable, in some stocks at least, that the abnormalities do not develop, but Malling XII is not above suspicion. In one plantation in Surrey, Lambourne on this stock has made large trees, but the fruits are of very poor size and quality, whereas trees on I and II have normal growth and bear fruits of normal size.

It is calculated that both conditions appear to be of virus origin and to have been brought about by grafting. Lambourne should not, for the present, be used for top-grafting. When propagating Lambourne directly on to rootstocks (or for any other purpose) buds and scions should be taken only from normal trees. Until more is known, it would be prudent to withhold the budding or grafting of Lord Lambourne on to Malling No. XII, and use Nos. I and II.

D'OLIVEIRA (B.). **A Estação Agronómica e os problémas nacionais de fitopatologia.** [The Agronomic Station and the national problems of phytopathology.]—*Rev. agron., Lisboa*, xxx, 3, pp. 414–438, 1942–3.

Among the problems confronting Portuguese plant pathologists may be mentioned (besides those already noticed in this *Review*) the following. The remedy for the devastating epidemics of vine downy mildew [*Plasmopara viticola*], such as that of 1936, which result in widespread unemployment and other economic disturbances, lies in the development of resistant varieties.

Black rust of wheat (*Puccinia graminis*) [*R.A.M.*, xx, p. 455] causes an average annual reduction in yield of 10 per cent., while *P. glumarum* and *P. triticina* are each responsible for a decrease of over 5 per cent. In 1940, *P. coronata* decimated the oat crops, leaving a bare sufficiency of seed for the next season's sowing.

Virus diseases frequently infect over 60 per cent. of the seed of a bean crop, other sources of damage to which include *Uromyces appendiculatus*, anthracnose [*Colletotrichum lindemuthianum*], bacterioses, and fusarioses. *Botrytis* [*cinerea*] is among the limiting factors in broad bean cultivation. Thanks to the enterprise of Dr. Mathilde Bensaude, a start has been made on the production of potatoes from mass-selected healthy tubers. Breeding for resistance to disease is one of the major activities of the Station.

MARCHIONATTO (J. B.). **Manual de las enfermedades de las plantas.** [Manual of plant diseases.]—368 pp., 159 figs., Buenos Aires, Editorial Sudamericana, 1944.

In 1942, one of the author's students, M. V. Fernandez Valiela, published a comprehensive treatise on phytopathology, with special reference to Argentina [*R.A.M.*, xxiv, p. 28]: in the present manual, therefore, no attempt has been

made to cover the same ground, the object being rather to provide more specialized information than to follow the curricula laid down by the Buenos Aires and La Plata Universities. The two first and longest chapters deal with bacterial and fungal diseases which, together with those caused by vascular parasites (Chapter III), are of major importance to producers. Chapters IV, V, and VI are concerned, respectively, with virus and physiogenic diseases and control measures. A short bibliography and a useful glossary are appended.

CHESTER (K. S.). **Defoliation and crop loss.**—*Plant Dis. Reptr*, xxix, 6, pp. 162–168, 1945. [Mimeographed.]

Measurement of crop yield reduction following artificial defoliation is a useful way of obtaining evidence of the extent of losses sustained by crops which have lost foliage as a result of disease or insect attack. Data from the literature relating to wheat, oats, barley, maize, flax, and onions have been combined with new matter, rearranged, and put into graphical form. In general, crop losses caused by artificial defoliation give a conservative estimate of those due to defoliation or loss of useful leaf area by disease. If a 20 per cent. crop loss is regarded as serious and demanding preventive measures, it is found that this loss, or much more, is registered if the plant is completely defoliated at any time during the greater part of its life or even if partly defoliated at mid-season. Thus, it is wrong to appraise a crop in mid-season as having a 'slight' or 'negligible' attack that showed a loss of 25 per cent. of leaf or useful leaf area at that time. There is a regular ratio between crop loss and loss of area, so that a control measure which reduces leaf disease without eliminating it has a decided value. There is a stage at which the effects of defoliation are most marked—the tassel stage in maize, wheat, and oats, the rosette stage in barley, and the bud stage in flax. *Septoria tritici*, for example, has been wrongly regarded as a pathogen of little consequence. Its effects are serious, for it destroys much leaf tissue at the most critical time. There are important secondary effects of leaf loss. In wheat the grain contains less protein and sugars, the 1,000-kernel weight is less and the flour is shown by tests to be inferior, while maturity is delayed by as much as 10 days, and this may result in further losses due to late season and disease.

HOPKINS (C. Y.) & COLDWELL (B. B.). **Surface coatings for rotproofing wood.**—*Canad. Chem. Process Industr.*, xxviii, 12, pp. 849–851, 1 fig., 1 diag., 1944.

A comparatively rapid method has been devised for determining the efficiency of surface coatings for the rot-proofing of wood, involving the use of very thin strips (yellow birch veneer, 0·01 in. in thickness in the tests described) offering a large surface area to the action of the fungi and bacteria occurring in profusion in the moist, warm ($28 \pm 1°$ C.) composted earth in which ten strips are buried for 28 days after one minute's immersion in a preservative at room temperature. On removal from the soil, the specimens are washed under the tap, dried, and conditioned, and their breaking strength calculated as the percentage of that of ten similarly treated but unexposed strips. Ordinary varnish sealers failed to prevent decay and only slight protection was afforded by a heavier-bodied spar varnish, but properly formulated rot-proof coatings gave a high degree of protection for the period of the test. The permanence factor was studied in a series of tests in which the specimens were (*a*) exposed before burial to 'weatherometer' treatment, consisting of 96 hours' exposure to a carbon arc lamp and water spray, (*b*) heated in an oven at 105° for 48 hours, and (*c*) immersed in water (changed daily) for a week. The efficacy of three out of five preservatives was destroyed by the high-temperature treatment, while the 'weatherometer' rendered one of the coatings valueless; the effects of immersion were less serious.

Report on A.A.T.C.C. co-operative tests for determining mildew- and rot-resistance, November, 1943–July, 1944. Prepared by the Sub-Committee on Mildew Proofing.—*Amer. Dyest. Reptr*, xxxiv, 7, pp. P 128–135, 139–140, 6 graphs, 1945.

By July, 1944, reports covering one or more of the six mildew testing procedures adopted at the April, 1943, meeting of the Sub-Committee on Mildew Proofing of the American Association of Textile Chemists and Colorists had been received from 12 different laboratories of interested organizations. From this detailed, tabulated summary of the results of the co-operative experiments it appears that a reasonably practical evaluation of fungicidal treatments may be arrived at by the application of one or more of the testing methods, including at least one pure culture (of *Metarrhizium glutinosum*, *Chaetomium globosum*, or *Aspergillus niger*), and one soil contact (suspension or burial) test [cf. *R.A.M.*, xxiii, pp. 310, 450; xxiv, p. 159].

Frayer (J. M.). **Control of mold growth in composite milk samples.**—*Canad. Dairy J.*, xxiii, 8, pp. 25–26, 34, 1944.

In studies at the Vermont Agricultural Experiment Station the writer found that mould [chiefly *Oospora lactis*: *R.A.M.*, xxiv, p. 241] growth in composite milk samples is commonly first detected in the bottle stoppers. It may be effectively combated by thoroughly cleaning and scalding the bottles and soaking the well-cleaned stoppers overnight in a 50–50 formalin solution between each testing period. Rubber stoppers, being easier to sterilize, should be substituted for cork. Samples should be kept at a temperature not exceeding 50° in covered trays or boxes, preferably of metal, which must be cleaned and sterilized between testing periods. Mouldy composite milk samples may test too low and are hard to pipette. Sources of contamination include the milk itself, the sampler's hands and clothes, sample bottles, stoppers, and storage boxes, and from the refrigerator walls, ceilings, and air.

Foster (J. W.) & Karow (E. O.). **Microbiological aspects of penicillin. VIII. Penicillin from different fungi.**—*J. Bact.*, xlix, 1, pp. 19–29, 1945.

The anti-bacterial substances present in culture filtrates of *Aspergillus niger* YW, *A. nidulans*, *A. oryzae* TP, *A. flavipes*, and *Penicillium citreo-roseum* were shown by experiments on their solubility properties, stability in regard to heat and P_H, anti-bacterial spectra against 18 bacteria, destruction by the enzyme penicillinase (*J. Bact.*, xlix, pp. 7–17, 1945), and efficacy in the protection of mice against *Diplococcus pneumoniae* Type 1 to be either identical with, or closely related to, authentic penicillin produced by *P. notatum*. Substrains superior in penicillin-yielding capacity to the parent culture of *A. oryzae* were isolated. The optimum temperature for growth and penicillin production was 37° C. for *A. oryzae* and 25° for the other species under observation. Kojic acid was more effective in the inhibition of the Gram-negative than in that of the Gram-positive organisms tested.

Peterson (W. H.), Snell (J. F.), & Frazier (W. C.). **Fodder yeast from wood sugar.**—*Industr. Engng Chem.*, xxxvii, 1, pp. 30–35, 1945.

About 150 fermentations of hydrolysates from 13 species of wood with nine types of yeast were run and the yields of yeast determined at the United States Forest Products Laboratory, Madison, Wisconsin. Pre-treatment of the hydrolysate was found to be necessary to ensure good yields, and the best of the four procedures tested involved the following steps, the quantities of materials being based on 5 to 6 per cent. reducing sugar. Calcium carbonate was added (0·75 gm.

per 5 gm. reducing sugar) to adjust the P_H to 5, and after the admixture of 0·05 per cent. sodium sulphite the solution was heated to boiling, cooled, and filtered through a pad of hy-flo supercel. Then 0·06 gm. urea and 0·05 gm. potassium dihydrogen phosphate per gm. reducing sugar were added and the solution diluted to the desired concentration for fermentation.

Torula [*Torulopsis*] *utilis* No. 3 [cf. *R.A.M.*, xxiii, p. 494], *Candida tropicalis*, and an unidentified yeast gave the most promising results in preliminary trials, and the first-named, by reason of its well-known nutritive properties, was selected for use in the subsequent experiments. Acclimatization of the yeast to wood sugar increased the yield, which was further affected by the composition and hydrogen-ion concentration of the medium, temperature, rate of aeration, and time of fermentation. Within the limits tested, conversion of carbohydrate to cells increased in efficiency with increasing aeration. In bottles complete fermentation was obtained in 16 hours with the standard inoculum level and a temperature of 30° C., but the time could be reduced by raising the inoculum to higher levels (5 to 6 gm. per l., dry weight) and the temperature to 34° or 35°. Adjustment of the initial P_H to a range of 4·5 to 5·5 resulted in suitable conditions for yeast production. Yields (calculated as dry yeast) of 35 to 40 per cent. of the total reducing sugar in the hydrolysate were secured regularly. About 90 per cent. of the apparent reducing sugar was fermented, the remainder being probably unfermented pentoses and non-sugar-reducing substances. Hydrolysates from spruce and southern yellow pine [*Pinus* spp.] gave good fermentations, but those from Douglas fir [*Pseudotsuga taxifolia*] were very difficult to ferment. The wood sugar from maple [*Acer*], yellow birch, and beech yielded equally well with the hydrolysates from the best softwoods.

STUBBS (J. J.), NOBLE (W. M.), & LEWIS (J. C.). **Fruit juices yield food yeast.**—*Food Industr.*, xvi, 9, pp. 68–70, 125, 1 fig., 1944.

A tabulated account is given of the procedure employed at the Western Regional Research Laboratory, Albany, California, for the production of *Torulopsis utilis* [see preceding abstract] from fruit syrups or concentrates of prunes, figs, and raisins and press juices of apples, pears, and peaches. Yields of 42 to 58 gm. dry yeast per 100 gm. sugar were obtained in the laboratory-scale fermenters, while those from prune syrup in pilot-plant equipment were somewhat higher. The protein content of the yeast, calculated from the nitrogen content, was shown to range from 53 to 58 per cent., and assays reported for eight members of the vitamin B group correspond to published values for unfortified brewers' and bakers' yeasts.

SCIARINI (L. J.) & WIRTH (J. C.). **Ethanol production from wheat hydrolysates and stillage by yeast and Fusaria.**—*Cereal Chem.*, xxii, 1, pp. 11–21, 1945.

By the application of a pentose fermentation with spore-mycelial suspensions of *Fusarium lini* from a synthetic medium to sulphuric acid-hydrolysed dark northern spring wheat mashes, an increased yield of alcohol was obtained amounting to 6 to 12 per cent. more than derived from a compressed bakers' yeast fermentation of the hexoses [cf. *R.A.M.*, xxiv, p. 67]. By the application of acid hydrolysis to industrial plant stillage, comprising dextrins, hexoses, and pentoses, an additional yield of about 13 per cent. alcohol was secured by yeast fermentation.

MAGROU (J.) & MARIAT (F.). **Action de l'aneurine sur le développement des embryons d'Orchidées.** [The action of aneurin on the development of Orchid embryos.]—*Ann. Inst. Pasteur*, lxxi, 1–2, pp. 49–51, 1945.

In experiments on the growth of *Cattleya* embryos on Knop's agar plus 20 per mille saccharose, the addition of aneurin (vitamin B_1) at a concentration of 1·86 γ

per c.c. markedly stimulated the development and differentiation of the young plants [cf. *R.A.M.* xxiv, p. 200]. Thus, on 8th December, 1943, three months after sowing, the average diameter of the plants in the tubes enriched with the vitamin was $592 \pm 13\mu$ compared with $458 \pm 12{\cdot}6\mu$ for the controls. At the age of four months nearly all the plants supplied with the growth substance had produced a well-developed bunch of leaves, whereas most of the controls were still in the spherule stage. The green coloration of the treated embryos, moreover, was much brighter than that of the untreated.

CAMPBELL (W. A.) & PRESLEY (J. T.). **Design for constant temperature tanks.**—*Phytopathology*, xxxv, 3, pp. 213–216, 2 diags., 1945.

Details are given of the construction of modified constant-temperature tanks, modelled on those originally developed at the University of Wisconsin [*R.A.M.*, vi, p. 366], for studies on the relation of soil temperatures to the infection of guayule [*Parthenium argentatum*] by soil fungi at Salinas, California.

Aspergillus niger.—*Aust. J. Sci.*, vii, 2, p. 54, 1944.

The United States Department of Agriculture is using *Aspergillus niger* as the basis for a rapid, precise, and economical method of determining the presence or absence in the soil of the rarer elements essential to plant growth. The mould's mineral requirements are identical with those of green plants, except that it needs no calcium, silicon, or boron. According to R. A. Steinberg, experiments have shown that a few parts per million or per billion of such elements as zinc, copper, and molybdenum are as important to the growth of *A. niger* [cf. *R.A.M.*, xxi, p. 35] as much larger quantities of the more familiar plant foods, potassium and phosphorus. The mould thus serves as an index in particular cases to the presence or absence of any of these micronutrients, which are as indispensable to field, garden, and greenhouse crops as they are to *A. niger*.

EPPS (W. M.). **Purple-top wilt of Potatoes.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 363–365, 1943.

Field and greenhouse studies carried out from 1939 to 1941 on purple-top wilt of potatoes [*R.A.M.*, xxiv, p. 70] showed that, in addition to the 22 New York weeds previously listed as suspects, 20 others were susceptible. Three of these were found naturally diseased in the field. Since its description by Muncie in Michigan in 1932 under the name of 'moron' disease [ibid., xii, p. 188], it has been reported from California, North Dakota, Minnesota, Wisconsin, West Virginia, Maryland, Pennsylvania, New York, and Maine; the disease recorded from Alberta as 'purple dwarf' [ibid., xx, p. 318] is probably the same.

The direct loss in yield is often serious, especially if the plants become infected before the tubers reach marketable size. This loss, however, is often only of secondary importance compared with the reduction in cooking quality, and the loss of market value caused by the internal necrosis of the tuber. The sprouts from tubers on affected plants are often weak and slender, with the result that such tubers are unfit for seed purposes. The disease is, however, of minor importance except in certain parts of Pennsylvania and West Virginia, where it is one of the chief factors limiting potato production.

Experimental evidence demonstrated that the disease is caused by the New York aster-yellows virus [ibid., xxii, p. 269]. Little difficulty was experienced in producing the disease on potatoes by means of insect inoculations, but all attempts to transfer the virus directly from a diseased potato to a healthy aster by means of previously non-infective aster leafhoppers (*Macrosteles divisus*) were failures, although these insects successfully transferred the virus to asters from *Nicotiana rustica* plants on which scions from diseased potato plants had been grafted.

The aster-yellows virus overwinters on various perennial and biennial weeds, of which the most important are the ox-eye daisy [*Chrysanthemum leucanthemum*] and the broad-leaf plantain [*Plantago major*].

The incubation period in the potato plant varies with the time of year and the variety. It is shorter in summer and longer in winter; in the Katahdin variety in late spring it is about 26 days, or about 10 shorter than in Green Mountain and Russet Rural.

Control measures recommended include roguing, planting seed obtained only from unaffected fields, increasing the seeding rate to allow for weak sprouts and poor stands, separating the potato field from weed areas or destroying weeds adjacent to it, early planting, and the use of resistant or tolerant varieties.

PETERSON (L. C.). **Studies on the late blight of Potatoes and its causal organism, Phytophthora infestans (Mont.) de Bary.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 380–382, 1943.

When potato seed experimentally inoculated with *Phytophthora infestans* was planted 10 per cent. produced diseased aerial shoots. Seed planted within an inch of inoculated tubers gave only disease-free plants. The rate of sporulation became greatly reduced within three weeks from the date of tuber-planting. The rapid spread of a species of *Fusarium* and soft-rot organisms over blight lesions on seed pieces is an important factor in limiting the duration of sporulation.

Various Solanaceous plants known to grow wild on Long Island, as well as representative members of the family grown in gardens, were tested as possible overwintering suscepts. Most of the perennials inoculated were highly resistant, but *Atropa belladonna*, egg plant, and *Solanum dulcamara* were susceptible. Sporulation could be induced only on lesions on the last-named which was, however, found infected in nature.

A comparison of the growth rates of *P. infestans* showed that growth was more rapid on Lima bean agar than on maize meal or oatmeal agars.

In a study of the factors promoting growth on Lima beans, it was ascertained that growth on a synthetic medium to which a water extract of Lima beans had been added was almost as good as that on Lima bean agar. This factor was dialysable, destroyed by autoclaving for one hour at P_H 10, and relatively unaffected by autoclaving at P_H 4 or 7.

Further studies showed thiamin to be an important factor for the good growth of *P. infestans* on Lima bean agar. The addition of 1 mg. ascorbic acid and of 0·5 mg. thiamin chloride to 100 c.c. potato dextrose agar gave excellent growth, but the addition of these vitamins to Lima bean agar failed to increase the growth.

BLODGETT (E. C.). **Water rot of Potatoes.**—*Plant Dis. Reptr*, xxix, 4, pp. 124–126, 1945. [Mimeographed.]

Water rot of potatoes, a new popular name used for a well-known disease occurring in Idaho, was at one time thought to be of a physiological nature, caused by lack of aeration and excessive moisture followed by secondary infection. The writer believes that moisture and temperature are predisposing conditions, but that the pathogen is *Phytophthora erythroseptica*, which was isolated repeatedly from typical samples and identified by Dr. Ray and Dr. C. M. Tucker. Evidence showed that most infection occurs in the field (up to 50 per cent. of the crop may show symptoms at digging) and not in storage, and tuber transmission and the build-up of inoculum in the soil are very important. Although wet, heavy soil and heavy manure of sheep and lucerne naturally predispose the soil to infection, the disease is also known in sandy soils and is on the increase. Typical water rot resembles frost injury. The outer tissue near the stem end darkens and assumes a water-soaked appearance. The inner rotted tissue is a creamy-white at first,

darkening later. A characteristic symptom is a slipping of the skin. Affected cut tubers turn pink in the air. It is not known whether the foul odour of fermentation is due to the above-mentioned fungus or to secondary organisms. The importance of the disease in Idaho and its future potentialities suggest that more information is desirable and perhaps necessary in order to prevent serious losses.

PERSON (L. H.). **Pathogenicity of isolates of Rhizoctonia solani from Potatoes.**—*Phytopathology*, xxxv, 2, pp. 132–134, 1945.

In recent studies at the Louisiana Agricultural Experiment Station on the pathogenicity of *Rhizoctonia* [*Corticium*] *solani* to beans [*R.A.M.*, xxiv, p. 88], none of the isolates from potato attacked the test plants. In additional inoculation tests on beans with 101 cultures from sclerotia on potato tubers and 29 from potato stem lesions, only three of the former were slightly injurious, while ten of the latter proved to be pathogenic (nine actively so). Two bean and two sugar beet isolates used as controls caused severe damage. In similar experiments on potatoes with 70 cultures, five were strongly pathogenic, 13 and 35 moderately and slightly so, respectively, and 17 caused no injury. The bean and sugar beet controls produced intermediate effects. Of the three cultures from sclerotia on tubers that had been pathogenic to beans, one was innocuous and two only slightly injurious to potatoes.

DECKER (P.). **A study of the pathogenicity of some Actinomyces from the soil.**—*Abstr. Thes. Cornell Univ., 1942*, pp. 358–360, 1943.

In greenhouse pathogenicity studies, 116 different cultures of *Actinomyces* from potatoes [cf. *R.A.M.*, xviii, p. 412], 8 from beets, and 3 from carrots, together with 65 named cultures [of *Actinomyces*] were increased on potato dextrose agar in Petri dishes and washed into sterilized pots of soil when potato seed pieces of the Green Mountain and Cobbler varieties were planted.

The morphological character of acid-fastness used by Taylor was perfectly correlated with the physiological character of starch hydrolysis. A larger percentage of the non-acid-fast than of the acid isolates produced a russeted injury, but this character could not be correlated with pathogenicity. The presence or absence of a dark brown surface ring on milk separated the isolates into two groups, with 66 positive and 79 negative. All the members of the positive group were pathogenic to potatoes, but none of the negative group produced typical scab lesions.

Pathogenic and non-pathogenic cultures were obtained from a single scab lesion on the potato tuber. Several isolates from beet were pathogenic to potato. Pathogenicity tests in the greenhouse were more severe than natural infection in the field, particularly with later-maturing varieties. Certain U.S.D.A. seedlings and the Hindenburg variety, normally resistant in the field, were moderately susceptible in the greenhouse.

A factorially designed experiment was carried out under greenhouse conditions to determine the influence of various factors on the development of scabbed tubers. Watering through the aperture in the bottom of the pots was more satisfactory for scab development than watering from the top. Spread of the causal organism by water splashed from one pot to another did not occur, neither were the fungi air-borne.

C[ARDENAS] (M.). **La Phytophthora infestans en Cochabamba.** [*Phytophthora infestans* in Cochabamba.]—*Rev. Agric., Cochabamba*, ii, 4, p. 41, 1944.

For two years in succession potato late blight (*Phytophthora infestans*) has occurred in the Department of Cochabamba and other districts of Bolivia, as well as in Cuzco, Peru. Wild species growing in the environs of the city of Cochabamba

have shown equal susceptibility with the cultivated, so that the elimination of the pathogen is likely to prove impracticable. The tubers appear to be relatively resistant, unlike the foliage which is completely destroyed by the disease. The development of varieties resistant to the local strains of *P. infestans* is recommended.

SLEETH (B.). **Pre-emergence damping-off control in Guayule with phenyl mercuric fungicides.**—*Plant Dis. Reptr*, xxix, 5, pp. 139–140, 1945. [Mimeographed.]

Phenyl mercuric salicylate (mersolite 19) at dosages of 0·1, 0·2, and 0·3 per cent., and phenyl mercuric acetate (mersolite 8) at 0·1, 0·3, and 0·5 per cent., applied to guayule (*Parthenium argentatum*) seed, effectively controlled damping-off (*Pythium ultimum*), and permitted 80 to 86 per cent. seedling emergence, compared with 3·2 per cent. in the control rows, the next best result (67·2 per cent.) being secured with 4 per cent. phenyl mercuric chloride (mersolite 2) in bentonite clay at a dosage of 1 per cent.

WALLACE (T.). **Diagnosis of mineral deficiencies in crop plants.**—*Nature, Lond.*, clv, 3937, pp. 444–446, 1945.

This is a summary of two lectures delivered at the Royal Institution on 30th January and 6th February, 1945, embodying in an abridged form the information on the diagnosis of mineral deficiencies in crop plants already presented from another source [*R.A.M.*, xxii, p. 406].

GILMAN (J. C.). **A manual of soil fungi.**—392 pp., 135 figs., Ames, Iowa. The Collegiate Press Inc., 1945. $5.00.

This volume is a revised and greatly enlarged edition of 'A summary of the soil fungi' published by the author and E. V. Abbott in 1927 [*R.A.M.*, vii, 57]. It is designed to place a tool in the hands of investigators that will enable them to identify the soil fungi which they may encounter in the course of their work. The book does not profess to contain much new information, the author's primary object having been to assemble the descriptions of fungi isolated from the soil in pure culture. The body of the treatise presents a key to the classes, orders, and families of soil fungi and full descriptions (frequently reprinted from standard works) of each organism recorded, while other features are references to their geographical distribution and a bibliography of 169 titles, glossary, and index.

MARTIN (J. P.). **Microorganisms and soil aggregations: I. Origin and nature of some of the aggregating substances.**—*Soil Sci.*, lix, 2, pp. 163–174, 1945.

Two soil microbes, a fungus of the genus *Cladosporium*, and an aerobic bacillus, apparently related to the *Bacillus subtilis-mesentericus* group, were found to effect marked aggregation of the silt and clay particles of the soil at the Idaho Agricultural Experiment Station. In the case of the fungus, the conglomeration was brought about in approximately equal measure by cellular substances and the binding influence of the mycelium. The active aggregating material, consisting in the main of a hemicellulose-like polysaccharide synthesized by the soil bacillus, was only slightly attacked by fungi (*Aspergillus niger*, *Penicillium* sp., and *Rhizopus nigricans* [*R. stolonifer*]) in culture experiments, but was readily destroyed by certain bacteria and *Actinomyces coelicolor*. Evidently, therefore, its contribution to enhanced soil aggregation is likely to be only temporary.

KEYWORTH (W. G.). **Three important Hop diseases.**—*J. Minist. Agric.*, li, 12, pp. 556–561, 3 figs. (facing p. 555), 1 map, 1945.

During the past 20 years, hop *Verticillium* wilt [*V. albo-atrum* and *V. dahliae*: *R.A.M.*, xxiv, pp. 137, 153], nettlehead [ibid., xxii, p. 38], and mosaic [ibid., xxiii,

p. 2 and next abstract] have become increasingly important in Britain, where they now constitute a major problem. A special investigation, started in 1938, has shown that, contrary to the view commonly held hitherto, the mild or fluctuating type of *Verticillium* wilt is very widely distributed. This form of the disease has been reported from Kent, Sussex, Herefordshire, and Worcestershire. There is, however, no danger of any wholesale attack on the crop. This fluctuating type of wilt was first discovered by R. V. Harris in 1924 in a hop garden at Penshurst, Kent, since when the total effect on the crop has been virtually negligible. In other affected gardens no wilting has been noted, the only visible symptom being thickened bines on scattered hills. Some of the outbreaks have been traced to earlier potato crops, others to the planting of infected sets, while many are of such long standing that their origin is unknown.

The most important feature of the quite distinct and really dangerous form of wilt known as the progressive type is that affected hills do not recover. The first outbreak was found on a farm near Paddock Wood, Kent, in 1933; it had then been in existence a year or two. In 1934, the disease was found on five other farms in the vicinity. Since then, it has virtually ruined these farms, and has spread to about 50 others in a radius of about ten miles. It is in this comparatively limited area that the greatest danger from the disease exists; local growers should watch carefully for early signs of the trouble, and promptly remove affected hills. In other localities, the use of wilt-free planting material is advised. The Ministry of Agriculture's scheme for certifying wilt-free gardens will help to prevent further spread of either form of the disease. In addition, it is hoped that even badly affected farms may be brought back into production by the use of resistant varieties.

The virus diseases, nettlehead and mosaic, occur in all hop-growing areas. Nettlehead, while most prevalent in the Fuggle variety, attacks all varieties, while mosaic affects Golding only, and is therefore particularly important in Worcestershire and eastern Kent. Against nettlehead the best plan is to begin the removal of infected hills very early in the season, before the bines are trained, so that the hills can be picked out by their stiff bines and up-curled leaves. The cumulative and widespread losses from nettlehead make it the greatest single cause of loss to the hop industry as a whole. In young gardens, not only must obviously infected hills be removed, but also those showing only slight symptoms; as an added precaution in small outbreaks, all hills adjoining affected ones should be removed also. New gardens should be planted with disease-free stock only.

Mosaic carrier varieties, such as Fuggle and the Wye Seedling hops, should always be sown some distance away from Golding. It has recently been discovered that some male hops also act as carriers. Roguing and the planting of clean stock are as important against mosaic as they are against nettlehead.

SMITH (K. M.). **A further note on the viruses affecting Atropa belladonna and a description of a virus complex attacking Hyoscymus niger.**—*Parasitology*, xxxvi, 3–4, pp. 209–210, 1 pl., 1945.

An account has already been given of an undescribed virus affecting *Atropa belladonna* [*R.A.M.*, xxii, p. 451]. Further studies on this plant, which is widely grown on herb farms in the British Isles, have shown it to act as a symptomless carrier of *Hyoscyamus* virus 1 [henbane mosaic virus: ibid., xii, p. 243]. Inoculated into various species of *Nicotiana*, the latter virus induced the development of very clear, discrete, local lesions, especially in *N. sylvestris*, *N. langsdorffii*, and *N. rustica*, usually followed by systemic necrosis and death of the plants. The reaction of *Nicandra physaloides* appears to be wholly necrotic, all the middle and lower leaves being killed; no mottling was observed. The symptoms developing on tomato were those of an extremely severe streak disease, which was uniformly fatal to plants wintering in the greenhouse but assumed a milder form under

summer conditions. Seed from summer-grown fruits bearing ring-shaped necroses gave rise to healthy plants.

A spontaneously occurring, very destructive virus complex attacking *H. niger* was shown by inoculation experiments on tobacco, *Datura stramonium*, turnip, and stock (*Matthiola*) to consist of potato virus X and *Brassica* virus 1 [cabbage ring spot virus: ibid., xiv, p. 669]. In the course of the investigations the former virus was observed to form local lesions on the cotyledons of ridge cucumber without systemic infection, while the latter provoked similar reactions in *Nicotiana sylvestris*.

ASTHANA (R. P.) & MAHMUD (K. A.). **A new bacterial leaf-spot on Piper betle.**—*Curr. Sci.*, xiv, 3, p. 73, 1945.

A hitherto undescribed leaf spot was observed on the Bangla variety of *Piper betle* at Ramtek, Central Provinces, India, during December, 1943. Diminutive, pale yellow spots, rapidly turning dark purple, appear on, along, or between the veins on either leaf surface, those in the former positions being roughly circular or angular, while in the latter they are irregularly elongated or branched like fern leaves. Only in cases of advanced decay are the lesions, measuring 1 mm. to 1 cm. in width, visible on both surfaces. The infected foliage gradually turns yellow and falls.

Inoculation experiments on leaves of the Bangla and Kapuri varieties with bacterial suspensions or smears were successful, and the pathogen was recovered from the infected tissues. The organism attacks chiefly the parenchymatous cells, which slightly expand, assume a dark yellow tinge, and disintegrate. In the early stages it is confined to the epidermis, but subsequently invades the spongy and palisade parenchyma, while the phloem and xylem may be penetrated in the final phase. Two or three spots suffice to destroy a leaf, entry to which is effected through the stomata or directly through the epidermal wall.

The white colonies initially produced by the organism on bouillon agar plates turn maize yellow in 12 to 18 hours; they are round, thin, flat, glistening, and furcate, dry and brittle in texture. An outer ring and a lobate margin surround the well-defined central area, the lobes occasionally branching out in the semblance of a fern and appearing fan-shaped. The agent of the leaf spot is a rod-shaped bacterium, 2·5 by 1·2μ, occurring in pairs or chains of 3 to 12 or more cells, actively mobile, forming at 30° to 38° C. a profusion of spores which resisted ten minutes' heating at 90°. These characters place the organism in an entirely different category from *Bacterium betle* [*R.A.M.*, vii, p. 741], and it is therefore presumed to be a new species, to which the name of *Bacillus betle* is provisionally assigned.

C[ARDENAS] (M.). **La 'estalla de la Coca'.** [The 'splitting of Coca'.]—*Rev. Agric., Cochabamba*, ii, 4, pp. 41–43, 1944.

Various theories have been advanced in explanation of the so-called 'splitting' of coca [*Erythroxylon coca*] in Bolivia, a disorder characterized by the transformation of the leaves into aggregations of minute, squamous structures, similar to those developing in cases of witches' broom. It was suspected, for instance, that *Marasmius perniciosus*, the agent of witches' broom in cacao, might also be implicated in the coca disease under observation, but hitherto microscopic and cultural studies of the affected material have given negative results. Other possible agencies of the trouble are a virus or physiological or genetic factors, and further investigations along these lines are necessary before a definite statement concerning the etiology of 'splitting' can be made.

CRANDALL (B. S.) & DAVIS (W. C.). **Phytophthora wilt and stem canker of Cinchona.**—*Phytopathology*, xxxv, 2, pp. 138–140, 1 fig., 1945.

Previous reports of *Phytophthora* infection on *Cinchona* appear to have referred

exclusively to seedlings, and the authors also observed the disease on plants in this phase in Puerto Rico. In Guatemala, Colombia, and Peru, however, not only seedlings but also grafted stock and plantation trees at varying stages of maturity were found to be affected. The first symptoms on seedlings are ill-defined, brown, necrotic spots on the leaves, through the bases of which the fungus may traverse the petiole and enter the stem, killing the plant. On older grafted stock and young plantation trees elongated, slightly depressed cankers and die-back develop on the more succulent branches, and in some cases the terminal portion of every branch is destroyed, leaving clusters of brownish-black, dead leaves. The species of *Cinchona* attacked were *C. pubescens* (*C. succirubra*), *C. officinalis*, and the Ledger form of the latter in Guatemala, *C. pubescens* and *C. pitayensis* in Colombia, and *C. officinalis* (Ledger) in Peru.

From the leaves, petioles, and stems of the last-named a fungus tentatively determined as *P. parasitica* was isolated, and positive results were given by inoculation experiments on both wounded and unwounded material. This appears to be the first record of *P. parasitica* on cinchona and the first report of *Phytophthora* blight of the host in question in the western hemisphere. In other countries the disease has been variously attributed to *P. palmivora* (Philippines and India) [*R.A.M.*, xiii, p. 813; xv, p. 410] and *P. cinchonae* (Japan) [ibid., xvi, p. 408].

The eradication of wilted seedlings from the beds seems to have given a measure of control in Peru, while in Guatemala a considerable amount of material was saved by cutting back the tops of diseased grafted stock to well below the dead tip. Wherever the blight was observed, individuals and certain clonal lines gave evidence of resistance, and it is thought probable that selections combining a high alkaloid content with the capacity to withstand infection may be developed.

McMartin (A.). **Germination and yield in Sugarcane agriculture. A case for disinfection and protection of cuttings.**—*S. Afr. Sug. J.*, xxix, 1, p. 21, 1945.

In an experiment in Natal in which the treatment of sugar-cane cuttings against soil pathogens, notably *Ceratostomella paradoxa* [*R.A.M.*, xxiv, p. 249], was combined with the application of a fertilizer to the soil, the increase in yield due to the latter alone was 3 per cent., the corresponding figures for ceresan alone, the same plus fertilizer, and agrosan with and without fertilizer being 24, 31, 18, and 43 per cent., respectively. The results of a greenhouse experiment showed that the response to such treatment was enhanced in dry soil, an important consideration under local conditions.

McMartin (A.). **Sugarcane smut: reappearance in Natal.**—*S. Afr. Sug. J.*, xxix, 2, pp. 55, 57, 2 figs., 1945.

The attention of cane-growers is directed to the reappearance in Natal of smut (*Ustilago scitaminea*) [*R.A.M.*, xxiv, p. 166] on a few stools of C. 301. The disease was first observed in the country in 1877, and following energetic action by a committee of the Victoria Planters' Association, who issued a report on the subject in 1882, it was ultimately extirpated by the complete eradication of the susceptible China variety and the digging-out of infected stools of the more resistant types. Alternate hosts in Natal include *Imperata arundinacea* and *Erianthus saccharoides*. The available information on the distribution, symptoms, sources and modes of infection, virulence, and control of smut is briefly summarized.

Dymond (G. C.). **Cure of streak disease in Uba Cane.**—*Proc. Congr. S. Afr. Sug. Technol. Ass.*, xviii, pp. 83–85, 1944. [Abs. in *Sugar*, xl, 4, pp. 49–50, 1945.]

Seed pieces of Uba cane with about 60 per cent. streak disease infection were planted [? in Natal: *R.A.M.*, xxiii, p. 148] in a soil dressed with a moderate amount of compost. During the next two years there was no increase in the

incidence of infection, whereas the standing cane from which the seed pieces were taken developed 100 per cent. After the second cutting the ratoons were surface-dressed with fresh compost. By the end of the third year the number of diseased canes had fallen to 25 per cent. or so, and an examination during the fourth year revealed complete absence of streak. The healthy canes were then transplanted into a composted seed-bed adjacent to a severely infected planting and had developed no streak when inspected after six months. Soil fertility, consisting in this instance of an abundance of organic matter, would thus appear to be a contributory factor in the health of the canes, enabling them to recover from an otherwise fatal disease.

ABBOTT (E. V.) & SASS (J. E.). **Pathological histology of Sugarcane affected with chlorotic streak.**—*J. agric. Res.*, lxx, 6, pp. 201–207, 3 pl., 1945.

A study was made of the pathological histology of the buds, leaves, and stems of C.P. 29/320 sugar-cane affected by chlorotic streak in Louisiana [*R.A.M.*, xxiii, p. 500]. Some of the axillary buds from diseased stalks showed no histological abnormalities, while in others necrosis of the epidermis and mesophyll was present to a varying extent.

Development of the typical streaks on the leaves was accompanied by noticeable reductions in the number, size, and reaction to staining of the chloroplasts in the mesophyll and chlorophyll-bearing bundle-sheath cells. When necrosis occurred in these streaks, it originated in the mesophyll and involved the vascular bundles only after the mesophyll tissue had undergone extensive disintegration. In diseased leaves presenting a 'scalded' appearance, but lacking the distinctive streaks, thickening of the walls and gummosis sometimes proceeded in the xylem and phloem in advance of, or simultaneously with, comparable degeneration in the mesophyll.

Sporadic necrosis of the stem parenchyma tissue was observed. Gummosis was the sole abnormality of the conductive elements, the gum-like substance being either completely amorphous, somewhat striated and minutely granular, or aggregated into spherical or teardrop-shaped globules.

Spherical intracellular bodies staining deeply with safranin and iron-alum haematoxylin were detected in the stems and foliage of infected plants. Some of them were provided with a pellicle-like covering suggesting a wall, but their contents were homogeneous, with no indication of nuclear structure. Accumulations of a gelatinous substance, frequently simulating organized bodies, were present in the stems of some diseased plants. They were soluble in ether, xylol, dioxane, and chloroform, but not in ethyl alcohol, and stained brilliantly with Sudan III, denoting a fatty chemical basis. The various forms of gummosis and the bodies exhibiting some degree of structural organization are believed to be products of a disordered metabolism rather than agents of chlorotic streak.

PINTO LOPES (J.). **Contribuïção para o estudo dos Basidiomicetas portugueses. I–III.** [Contribution to the study of the Portuguese Basidiomycetes. I–III.]—*Brotéria*, xiii, 4, pp. 230–238, 1944; xiv, i, pp. 5–13, 1 fig., 1945.

Included in this critically annotated list of Portuguese Basidiomycetes (Part II of which was published in *Bol. Soc. broteriana*, Sér. 2, xvi, [pp. 215–225], 1942) are a number of wood-destroying fungi. Mention may be made in particular of *Polyporus betulinus* on birch, of which this is the first record for Portugal.

MERRILL (E. D.) & WALKER (E. H.). **A bibliography of Eastern Asiatic botany.**—xlii+719 pp., The Arnold Arboretum of Harvard University, Jamaica Plain, Massachusetts, 1938.

Included in this bibliography, covering China, Japan, Formosa, Korea, Manchuria, Mongolia, Tibet, and eastern and southern Siberia, and also comprising

outstanding published papers relating to adjacent areas, such as the Philippines, Indo-China, Siam, Burma, India, and central and northern Asia, are sections on plant pathology (p. 607) and fungi (pp. 629–636), both indexed by G. D. DARKER.

PRUTHI (H. S.). **Leaf-curl disease of Tobacco in India.**—*Indian Fmg*, v, 5, pp. 220–223, 2 pl., 1 diag., 1945.

Much of the information in this progress report on tobacco leaf curl in India, where investigations on this economically very important disease have been proceeding for the last six years at the Imperial Agricultural Research Institute, Pusa, has already been presented from other sources [*R.A.M.*, xxiv, p. 122]. It may be of interest, however, to note the following points. The disorder is most prevalent in the Gangetic Delta, comprising Bihar in the east and Sind and Baroda in the west, where it may assume an epidemic form, involving 60 to 70 per cent. or more of the crop, the cigarette varieties being particularly susceptible. Five types of symptoms [which are illustrated but not described] have been observed and are designated A, B, C, D, and X, the last-named being a mixture of two or more of the others. It is not yet known whether each type is caused by a specific virus, but they are all transmissible by the white fly *Bemisia tabaci*. There is some prospect of reducing the insect population to a minimum, and so decreasing the large-scale development of the leaf-curl virus, by spraying or dusting the crop at ten-day intervals for two months, beginning in the seed-bed.

BAWDEN (F. C.) & PIRIE (N. W.). **The liberation of virus, together with materials that inhibit its precipitation with antiserum, from the solid leaf residues of Tomato plants suffering from bushy stunt.**—*Brit. J. exp. Path.*, xxv, 2, pp. 68–80, 1944.

After the sap was expressed from minced Kondine Red tomato leaves infected by the bushy-stunt virus [*R.A.M.*, xxii, p. 458], the solid residues were found to contain about the same amount of virus as the sap. Liberation of the infective principle is best effected by incubating the residues for 15 hours at 42° C. with a commercial preparation of trypsin (0·1 per cent.) and then passing them through a roller mill, a certain proportion, however, being released by either procedure alone.

Purified preparations of virus from the sap and solid residues possess similar properties. Extracts of milled fibre contain some virus combined with chromoprotein to form a non-precipitating antigen; they do not precipitate with virus antiserum until the chromoprotein has been removed. Non-precipitating complexes of virus and chromoprotein can be formed by milling fibre of healthy plants to which purified virus is added. Extracts of fibre from healthy and diseased leaves incubated with trypsin contain material that inhibits bushy-stunt virus precipitation by its antiserum.

SMITH (K. M.). **Black ring disease of the Tomato.**—*Gdnrs' Chron.*, Ser. 3, cxvii, 3043, pp. 170–171, 1 fig., 1945.

Attention is drawn to the occurrence [? at the Plant Virus Research Station, School of Agriculture, Cambridge] of a new virus, inducing on young tomato leaves numerous small, black, coalescent rings which spread to the growing point and destroy it. At the same time, dark reddish streaks develop on the stem and petiole, the former sometimes also bearing black rings. The disease is fatal to young tomato plants. In its wide host range the new virus resembles tomato spotted wilt, the plants attacked including cucumber, French bean, *Primula obconica*, and nasturtium (*Tropaeolum*) [*majus*]. The mode of spread of the virus has not yet been ascertained. Further information on the distribution of black

ring is required, and growers are invited to submit specimens of suspected material for identification.

MIDDLETON (J. T.). **Noninfectious mosaic pattern of Tomato.**—*Plant Dis. Reptr*, xxix, 5, p. 141, 1945. [Mimeographed.]

Inoculation experiments on cucumber, tobacco, and tomato with juice from tomato leaves from Orange County, California, suspected of infection from tobacco mosaic gave negative results. The supposed disease was confined to restricted areas over which sodium chlorate had been applied for bindweed (*Convolvulus avensis*) control, and the chemical was evidently responsible for the symptoms, which consisted of stunting and chlorosis of the plants, with marked mottling and distortion of the foliage. As the interval between the treatments and tomato culture increased, these symptoms became progressively milder, but the spurious mosaic pattern was still discernible on plants grown on land to which sodium chlorate had been applied five years earlier.

HENDERSON (R. G.). **Testing of copper fungicides for control of Tomato blight in Southwest Virginia.**—*Tech. bull. Va agric. Exp. Sta.* 89, 18 pp., 3 graphs, 1943.

A full account is given of spraying and dusting tests carried out in south-western Virginia in 1941 and 1942 with copper oxide dust (containing 5·1 per cent. metallic-copper in 1941 and 4·1 per cent. in 1942), copper oxide spray (yellow cuprocide 1½ lb. per 100 gals.), tribasic copper sulphate dust, tribasic copper sulphate spray (both from the Tennessee Copper Company), and Bordeaux mixture 4–4–50 used as a spray against blight (due primarily to *Alternaria solani*, though in some cases infections by this fungus appear to be initiated by *Septoria lycopersici* and *Phytophthora infestans*) of Earliana (early), Pritchard (medium-early), and Marglobe (late) tomatoes [cf. *R.A.M.*, xxii, p. 157 and next abstract].

In 1941, when the season was dry during August and September, Earliana and Pritchard responded very favourably to the treatments, but Marglobe gave a greatly reduced yield as a result of the drought conditions, and the treatments failed to increase the yield of this variety over that of the controls. In 1942, rainfall during the growing season was much heavier. Earliana proved to be extremely susceptible to infection, and the yield of marketable fruit produced by it was very low. All the fungicides gave significant increases in yield with this variety over the untreated controls, but in general the degree of disease control on Earliana was unsatisfactory. The yields of Pritchard and Marglobe were considerably greater than in 1941, and all the treatments largely increased the amounts of marketable fruits from these two varieties. Bordeaux mixture was significantly better (5 per cent. level) than the other materials in increasing yields.

Bordeaux mixture delayed fruit maturity in every instance, as compared with the other treatments and the controls. This delay was most marked with the two later varieties, and was only slightly noticeable with Earliana in 1942.

In both seasons, the treatments markedly increased the percentage of No. 1 grade fruits. In 1941, the increase averaged about 10 per cent. for all varieties, whereas in the rainy season of 1942 it was about 30 per cent. for Marglobe, 25 per cent. for Pritchard, and 3 to 5 per cent. for Earliana.

It is concluded that the yield and quality of marketable tomatoes in south-western Virginia can be greatly increased by four to six applications of a copper fungicide. Copper oxide and tribasic copper sulphate applied as dust or spray markedly control leaf blight, but are less effective than Bordeaux mixture in a rainy season. Bordeaux delays the date of the harvest peak of fruit to a much greater extent than copper oxide or tribasic copper sulphate. Control in a season favouring infection, is more difficult on early than on late varieties.

HENDERSON (R. G.). **Further testing of copper fungicides for control of Tomato blight in southwest Virginia.**—*Phytopathology*, xxxv, 2, pp. 120–128, 2 graphs, 1945.

The results of experiments in south-west Virginia from 1940 to 1942 [see preceding abstract] showed that tomato early and late blights (*Alternaria solani* and *Phytophthora infestans*) and leaf spot (*Septoria lycopersici*) could be effectively combated by tribasic copper sulphate and cuprous oxide either in liquid or dry form. In 1943 further tests were carried out to determine the comparative efficiency of these two compounds in the latter more practicable and convenient state. Six applications of yellow cuprous oxide (4·1 per cent. copper) at the rate of 40 to 50 lb. per acre gave about 10 per cent. higher yields than comparable treatments with tribasic copper sulphate (6 per cent. copper). Supplementary applications of sodium nitrate at dosages of 100 and 50 lb. per acre, respectively, on 7th and 20th July and 100 lb. on 3rd August, reduced the harvest of marketable fruit by 8 per cent. or so, possibly in conjunction with the abnormal drought of August and September. The cuprous oxide dust was also more effective than the tribasic copper sulphate in the prevention of foliar infection by *A. solani* in the greenhouse, the difference being partly due to the insufficient blending of the toxicant in the latter preparation with the talc diluent.

WILSON (J. D.). **Further observations on the control of Tomato anthracnose.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxix, 226, pp. 56–63, 1944.

A paper by the author and H. A. Runnels recently noticed from another source [*R.A.M.*, xxiv, p. 209] gives later information concerning the most effective method of tomato anthracnose (*Colletotrichum phomoides*) control than that presented here. On the basis of the 1942–3 trials, the treatments recommended were five applications of fermate as a spray (2–100) or as a dust (10–90 talc), at ten-day intervals, the first to be made when the first-cluster fruits are about two-thirds developed.

STRONG (F. C.). **A study of calcium chloride injury to roadside trees.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxvii, 2, pp. 209–224, 4 figs., 1944.

Since 1930, the writer has investigated many cases of injury to trees along gravel highways treated with calcium chloride as a dust palliative, the chemical accumulating in substantial quantities in impounded run-off waters. The damage generally assumed the form of mild to severe leaf scorch indistinguishable from that caused by drought. Of the 12 kinds of trees tested for their reaction to the presence of calcium chloride in the soil, balsam fir (*Abies balsamea*) and white spruce (*Picea glauca*) were the least tolerant of all, beech, hard maple (*Acer saccharum*), cottonwood (*Populus deltoides*), and aspen (*P. tremuloides*) the most susceptible of the hardwoods, and red and white oaks (*Quercus borealis* and *Q. alba*) and American elm (*Ulmus americana*) the most resistant.

In experiments on elm and white pine (*Pinus strobus*) seedlings, incipient leaf and needle scorch developed in the latter as a result of applications of calcium chloride to the soil at the rate of 4 oz. per sq. yd. and increased in severity up to the maximum rate of 4 lb., at which damage to the former was only of moderate extent. Sodium chloride was even more toxic.

At the higher concentrations, the symptoms of calcium chloride injury are more distinctive and less liable to confusion with those due to drought, the leaves or needles turning pale green rather than brown, becoming dry and brittle, and being prematurely shed in the case of the hardwoods. Applications of calcium chloride and dust mixtures to the leaves induced a typical brown spotting but no scorch.

Improved methods of highway construction have greatly lessened the frequency of calcium chloride injury to roadside trees.

CRANDALL (B. S.), GRAVATT (G. F.), & RYAN (MARGARET M.). **Root disease of Castanea species and some coniferous and broadleaf nursery stocks, caused by Phytophthora cinnamomi.**—*Phytopathology*, xxxv, 3, pp. 162–180, 2 figs., 1 map, 1945.

Phytophthora cinnamomi, which the authors, in agreement with European authorities and C. M. Tucker in the United States, keep separate from *P. cambivora* [*R.A.M.*, x, p. 755; xviii, p. 825, *et passim*], has been found to cause a root rot similar to chestnut ink disease on the American chestnut (*Castanea dentata*) in Maryland, Virginia, North and South Carolina, Georgia, Alabama, Tennessee, and Mississippi, on *C. ozarkensis* in Arkansas, on *C. pumila* in South Carolina, *C. crenata* in Louisiana, and *C. alabamensis* in Alabama.

On seedlings the fungus causes a loss of green colour of the foliage, followed by wilting in the broadleaf species and die-back in the conifers. On older nursery stock the symptoms do not appear in the aerial parts until the root is almost completely rotted.

On coniferous stock the fungus causes a dry type of root rot, accompanied by resin depositions on and in infected portions, including the wood. On broadleaf trees the rot produced is dry except on *Robinia* and *Juglans*. It is usually reddish-brown, but as in the case of conifers is mottled brown and light green in recently invaded tissue. On both conifers and broadleaf species no line of demarcation is found between invaded and healthy tissue, the fungus advancing into the sound tissue in irregular wedge-shaped streaks. The fungus often appears to attack just below soil-level, its presence in above-ground tissues being indicated in conifers by an external resin flow and in broadleaf trees by a depressed area above the dead cambium.

The disease is thought to be responsible for the recession of the American chestnut from the lower Piedmont area of the Atlantic States into the upper mountain altitudes, and from southern Mississippi and Alabama into the hilly northern regions of those States. A similar movement of *C. ozarkensis* is definitely attributable to the ravages of *P. cinnamomi*, the pathogenicity of which was demonstrated on its native hosts, the European chestnut (*C. sativa*), *C. alnifolia*, *C. ashei*, *C. margaretta* var. *arcuata*, *Lithocarpus densiflorus*, and the oaks *Quercus alba*, *Q. borealis*, and *Q. montana* [ibid., xvi, p. 73]. Black walnut did not contract infection in these tests with isolates of *P. cinnamomi* from chestnut, but subsequent experiments with walnut strains gave positive results. Russian chestnuts from the Caucasus, grown from seed supplied by Dr. N. I. Vavilov in 1933, proved to be equally susceptible to the root disease with other forms of the European chestnut, and were further attacked to a moderate extent by *Endothia parasitica*. Both in greenhouse and field trials the Asiatic species *C. crenata*, *C. mollissima*, *C. henryi*, and *C. sequinii*, proved highly resistant to *P. cinnamomi* remaining in plots in infested soil for periods of 5 to 11 years, whereas *C. sativa* succumbed after one or two.

P. cinnamomi was further shown to be the agent of a similar root disease on 20 hard- and softwoods in nurseries in Arkansas, Delaware, Georgia, Louisiana, Maryland, North Carolina and Virginia, the most susceptible species being *Pinus resinosa* [ibid., xiv, p. 409], *Taxus cuspidata*, yew (*T. baccata*), *T. media*, larch (*Larix decidua* and *L. leptolepis*), walnuts (*Juglans nigra* and *J. regia*), oak (*Q. borealis*), *Rhododendron mucronulatum*, and birch (*Betula papyrifera*). In greenhouse inoculation tests, 20 isolates from 16 hosts in seven States were found to be capable of inducing the root disease on *P. resinosa* and European chestnut, and are therefore assumed to be identical. In these experiments isolates from *C. pumila*, *J. nigra*, *P. resinosa*, and *T. cuspidata* were severely pathogenic to Douglas fir (*Pseudotsuga taxifolia*).

No control measures, except those based on general sanitary practices, have yet been devised against the root rot.

Phytophthora cambivora as well as *P. cinnamomi* is stated to be present in the United States.

PORTER (C. L.). **A leaf spot of Ginkgo biloba.**—Abs. in *Proc. Ind. Acad. Sci., 1943*, liii, pp. 78–80, 1944.

Each summer since 1939, *Ginkgo biloba* trees at Purdue University, Indiana, have been severely attacked by a leaf spot tentatively attributed to *Phyllosticta ginkgo*, which produces on the foliage irregular, ashen areas with dark reddish-brown borders, often originating at the margin and sweeping inwards towards the petiole. Older lesions commonly bear a few dark-coloured pycnidia. The fungus appears to secrete exotoxins which impart a golden-yellow tinge to the tissues not immediately involved by the blight. The fruits may also be spotted. The parenchyma cells are the first to collapse, followed by the palisade layer, while the epidermal tissues retain their normal aspect until the final stages of the disease are reached, the heavily cutinized protuberances of the lower epidermis in particular remaining visible and intact after the complete disintegration of the other tissues. The vascular bundles are little affected. The leaf spot is not sufficiently serious to impair the vitality of the host, but it does detract from the charm of a tree which has hitherto enjoyed the reputation of freedom from fungal parasites.

MARTIN (J. F.). **Spread of White Pine blister rust during 1944.**—*Plant Dis. Reptr*, xxix, 7, pp. 194–196, 1945. [Mimeographed.]

The most interesting facts in connexion with the spread of white pine blister rust (*Cronartium ribicola*) in 1944 were the detection of infected trees in five new counties in north-eastern Iowa, a 65-mile southward extension of the disease on *Ribes* in California [*R.A.M.*, xxiii, p. 122], the discovery of the rust, also on *Ribes*, in Yellowstone National Park [Wyoming], and on *Pinus flexilis* in its natural range.

JACKSON (L. W. R.). **Root defects and fungi associated with the little-leaf disease of Southern Pines.**—*Phytopathology*, xxxv, 2, pp. 91–105, 3 figs., 1944.

Southern pines, particularly shortleaf (*Pinus echinata*) and to a lesser extent loblolly (*P. taeda*), Virginia (*P. virginiana*), pitch (*P. rigida*), and (occasionally) longleaf (*P. palustris*), suffering from the serious deterioration and dying-off known as 'little leaf' in the Piedmont region of several southern States and in the upper coastal plain of Alabama are characterized by yellowed needles, shortened twig internodes, reduced diameter growth, and a progressive die-back of the crown from the base upwards [*R.A.M.*, xx, p. 330 and next abstract]. A comparative examination of the root systems of three healthy and four diseased shortleaf pines revealed in the latter die-back of the feeding roots, dead primary and lateral roots, pitch cankers on the larger roots, and excessive exfoliation of the bark on the smaller ones, known as 'brown patch'. The last-named in a less conspicuous form is a normal feature of healthy trees also. The significance of the pitch cankers, which were present in some degree on healthy roots, cannot at the moment be conclusively assessed. Sound and diseased individuals did not differ perceptibly in the gross morphology of their root systems or in their mycorrhizal provision.

Associated with newly formed brown patches on both healthy and diseased pines was a new species of *Torula*, to which the name *T. marginata* is assigned. It differs from the closely related *T. ligniperda* [ibid., ii, p. 34] in its larger conidia (12 to 13 by 11 to 12 μ), borne on longer chains of 2 to 12, mostly 6, and a more compact and faster-growing mycelium with a sharply defined margin. A strain of *Poria cocos* [ibid., iii, p. 376; xxi, p. 396] isolated from sclerotia ('tuckahoes') on the roots of diseased trees differed in several respects from the published

descriptions of the fungus, notably in the formation of chlamydospore-like cells, fragrance of the mycelium on cooked wheat, and the development on potato dextrose or 2 per cent. malt agar of a dark brown mutant, arising from the crossing of different isolates but not of different cultures of the same isolate. Inoculated into two-year-old short-leaf pine seedlings, both *P. cocos* and *T. marginata* induced brown patches and wood infections, the action of the former being more rapid and its symptoms more virulent than was the case with the latter. In one series of tests, for instance, the number of plants killed in 12 to 90 days by three isolates of *P. cocos* ranged from 79 to 100 per cent., the corresponding figures for three of *T. marginata* being 185 days and 75 to 83 per cent., respectively. Comparable results were obtained in other experiments. The relative pathogenicity of the two fungi was not markedly affected by the addition of humus to the soil.

HEPTING (G. H.). **Reserve food storage in Shortleaf Pine in relation to little-leaf disease.**—*Phytopathology*, xxxv, 2, pp. 106–119, 2 graphs, 1945.

Quantitative analyses were made of the food reserves in the bark and wood of normal shortleaf pines (*Pinus echinata*) in comparison with those suffering from little leaf [see preceding abstract]. The root and trunk investigations covered an entire year, but the foliage was examined only once, in April, 1943.

The normal roots contained a minimum reserve in the autumn and a maximum of three times the minimum in the early spring. In the stems, the peak was between April and June. In healthy trees the reserve averaged about twice as much in the root bark as in that of the stem. In a normal root section 1 in. in diameter, an average of 68 per cent. of the reserves is in the bark.

The root bark of little-leaf trees contained an average of less than half as much food as that of healthy ones, and sometimes hardly any. On the other hand, the little-leaf stems were as well supplied with nutrients as normal ones. The average needle of diseased trees cut in April contained only 41 per cent. as much elaborated food as a comparable specimen from adjacent healthy ones, while the total foliated parts of the former were estimated to have a reserve food content less than 10 per cent. of the normal. In two roots from each of the same trees used in the foliar analyses the reserves of those affected by little leaf were only 33 per cent. of the normal.

A low synthesis of carbohydrates appears to be the reason of the decline symptoms in diseased pines, and the roots, which normally store larger quantities of food than the stems, and fluctuate more with seasonal changes, naturally suffer most from the malnutrition associated with little leaf. A remarkable effect of the root starvation is the accentuated formation of rough bark owing to the cork cambium cutting deeply into the food-storage region of the phloem. Less storage tissue thus remains in the root bark, and less accommodation is required for food on account of reduced synthesis. The excessive storage tissue is apparently cut off by cork cambium in process of deterioration as a result of starvation.

LYSAGHT (J. F.). **Regeneration of clear felled Insignis Pine at Whakarewarewa State Forest, Rotorua.**—*N.Z.J. For.*, v, 1, pp. 19–26, 1942–1944.

In the Rotorua district and elsewhere in New Zealand, hundreds of acres of *Pinus radiata* are being clear-felled annually, and the important problem of re-establishment urgently requires attention. In this connexion it is of interest to note that *Armillaria mellea* [*R.A.M.*, xvii, p. 714] was widespread in the stand before felling and has killed some of the replacements, usually at the age of two to three years, but in no case have more than 3 per cent. of the trees in any plot succumbed.

PLAKIDAS (A. G.). **Blight of Oriental Arborvitae.**—*Phytopathology*, xxxiv, 3, pp. 181–190, 3 figs., 1945.

The agent of the blight of oriental arborvitae (*Thuja orientalis*) in the southern United States already described [*R.A.M.*, xxiii, p. 195] has been shown to be a new species of *Cercospora*, herein designated *C. thujina*. It is characterized by densely fasciculate, flexuous, sparsely septate, yellowish-brown, plurigeniculate conidiophores, 26 to 105 by 3·3 to 5 (average 55·8 by 4·3) μ, and oblong, tapering, straight to slightly curved, basally obconic-truncate, faintly echinulate conidia, 19 to 56 by 4·9 to 6·6 (42·2 by 5·5) μ, with 1 to 7 (4·2) septa.

Inoculation experiments with ascospore isolates of a *Mycosphaerella* often observed either accompanying *C. thujina* or alone on diseased leaves and branches gave negative results, indicating that the former organism is unrelated both to the *Cercospora* and the blight.

In a small-scale spraying test in 1943, the progress of the disease was completely arrested by four applications between 15th June and 3rd September of 4–4–50 Bordeaux, copper oxide (cuprocide) at the rate of 3 lb. in 100 gals. water, or basic copper sulphate (tribasic) at a dosage of 6 in 100.

SPAULDING (P.) & HANSBROUGH (J. R.). **Decay in Balsam fir in New England and New York.**—*Tech. Bull. U.S. Dep. Agric.* 872, 30 pp., 5 graphs, 1944.

The data resulting from the dissection of over 1,100 balsam fir (*Abies balsamea*) trees 40 years old and upwards from eastern Maine, northern New Hampshire, and the Adirondacks, New York, have been analysed to show the relation of cull to age, diameter, site factors, and growth rates. Decay sufficiently severe to cause cull affected half the trees at 72 and all at 165 years. About a quarter of the total volume of all the trees was culled, principally in consequence of three rots, namely, top (*Stereum sanguinolentum*), brown butt (*Polyporus balsameus*), and white stringy (*Poria subacida*), the percentages caused by each being 54, 13, and 28, while miscellaneous fungi and form defects constituted the remainder. The butt rots appeared when the trees were about 40 years old, were present in half the number examined at 72, and caused some cull in half at 105. Top rot began at 40, was present in one-fifth of the trees at 90, and was usually responsible for much more cull than the butt rots, though the latter, when assuming a severe form, weakens the trees and renders them liable to windfall. At the age of about 70, in fact, decay from this source is of major importance in determining the correct rotation for the balsam fir.

On a volume basis, cull losses among the trees investigated were almost identical on good and poor sites, but calculated by percentage, the losses were higher on the latter. On a volume basis, cull was less in slow- than in fast-grown trees, whereas on a percentage it was much more nearly equal. The net periodic growth of fast-grown trees, after deducting decay cull, exceeded that of the slow-grown specimens by a ratio of 4 : 1 up to 70 years, when the difference began to drop. Extreme suppression, resulting in flat-top form, favours infection by *S. sanguinolentum*.

In the management of balsam fir for pulpwood, the writers recommend the immediate harvesting of merchantable stands which are largely over-mature and highly defective, to prevent further heavy loss. Having regard to cull from decay and windfall, the best cutting age appears to be about 70, with 80 as a maximum, by which time an average diameter of 8 to 9 in. is attained in unmanaged stands: these measurements may be substantially increased by appropriate silvicultural measures promoting the maintenance of a uniform growth rate, e.g., weeding and the girdling of dominant worthless hardwoods in young stands. The maximum cutting cycle should be about 20 years to obviate excessive intervening losses.

ENGLERTH (G. H.) & ISAAC (L. A.). **Decay of Western Hemlock following logging injury.**—*Timberman*, xlv, 8, pp. 35, 56, 2 figs., 1944.

Since logging 12 years earlier, over half the western hemlock [*Tsuga heterophylla*] trees (mostly under 25 in. in diameter) in a reserve stand near the Wind River Experimental Forest, Oregon, were found on dissection to have developed injuries through nearly all of which wood-rotting fungi had entered [*R.A.M.*, xxii, p. 231]. *Fomes annosus* was the predominant agent of decay, the other organisms concerned being *Poria colorea*, *P. subacida*, *F. applanatus* [*Ganoderma applanatum*], and *F. pinicola*. The disorganization extended for an average of 2·4 and a maximum of 8 ft. vertically beyond the scar, and penetrated to average and maximum depths of 4·8 and 12 in., respectively.

DARLEY (E. F.) & CHRISTENSEN (C. M.). **The culture designated Madison 517 identified as Polyporus tulipiferus.**—*Phytopathology*, xxxv, 3, pp. 220–222, 1 fig., 1945.

Cottonwood (*Populus deltoides*) and hackberry (*Celtis occidentalis*) sections were inoculated in August, 1943, by a recently described method [*R.A.M.*, xxii, p. 380], with a culture of Madison 517 [ibid., xvii, p. 5] and one of *Polyporus tulipiferus* isolated from a sporophore on a wound on the latter host at St. Paul, Minnesota. Two to five months later, the sections were placed under a greenhouse bench at 85° F. and watered occasionally. On the appearance of fruit bodies, water was dripped continuously on the pieces of wood until the attainment by the sporophores of full maturity, which occurred to a considerable extent in August, 1944. Macroscopically, the fruit bodies of both isolates were typical of those produced by *P. tulipiferus* in nature, being resupinate to effused-reflexed, the upper surface white, villose, and faintly zonate, and the lower one furnished with irregular, daedaloid pores disintegrating into concentrically arranged teeth. Sporophores formed by Madison 517 were identified by L. O. Overholts as *P. tulipiferus*. The average (of 60) spore dimensions of Madison 517 were 5·2 by 2·8 with a range of 4·1 to 6·5 by 1·9 to 3·5 μ, the corresponding figures for *P. tulipiferus* being 4·9 by 2·8 and 3·7 to 6·4 by 2·3 to 3·3 μ, respectively. The average diameter of 25 basidia from each sporophore was 5·2 μ with ranges of 4·7 to 5·9 and 4·7 to 5·2 μ for Madison 517 and *P. tulipiferus*, respectively. The hymenia of the fruit bodies of both isolates contained an abundance of the encrusted cystidia characteristic of *P. tulipiferus*, protruding up to 30 μ beyond the basidia.

The evidence here presented is regarded as conclusive proof of the identity of Madison 517 with *P. tulipiferus*.

FINDLAY (W. P. K.). **Some factors influencing the rate of decay in wood.**—*Chem. & Indust.*, 1945, 7, p. 55, 1945.

In this paper, delivered at a joint meeting of the Society of Chemical Industry (Food Group, Microbiological Panel) and the Society of Agricultural Bacteriologists on 10th January, 1945, the available information containing the factors affecting the rate of fungal decay in wood are briefly summarized. The three factors discussed are the species of fungi involved (brown and white rots); physical condition of the wood, especially its moisture content (optimum 35 to 45 per cent. in most cases) and temperature (usually about 30° C.); and relative susceptibility of different kinds of timber, largely associated with the presence in the wood of extractives toxic to the invading organisms. Preliminary experiments have shown that the considerable variations in resistance that may occur within a single lot of a durable species, such as western red cedar [*Thuja plicata*], are related to the concentration of the toxic extractive in the different parts.

RENNERFELT (E.). **The growth of some putrefactive fungi on mechanical wood pulp.**—*Svensk bot. Tidskr.*, xxxvi, pp. 301–311, 1942. [Abs. in *Chem. Abstr.*, xxxviii, 13, p. 3469, 1944.]

Mechanical wood pulp was inoculated with 20 different species of fungi, of which only a few, such as *Fomes annosus, Lenzites betulina*, and *Polyporus vaporarius* [*Poria vaporaria*] (Eberswalde), attacked the material to any marked extent, causing brown discoloration and loss of weight (19 to 25 per cent.) [*R.A.M.*, xxiii, p. 506]. The action of *Lentinus abietina* and *L. lepideus*, on the other hand, was barely noticeable. The effects of the fungi on the wood pulp are more pronounced if ingress is gained parallel to the pulp sheet than if a perpendicular route is followed. Pulp from eight wood pulp plants showed variations of 12 to 25 per cent. loss of weight as a result of inoculation with *Polyporus* [*Polystictus*] *versicolor*, samples put through a hydraulic press being attacked more rapidly than those subjected to kamyr-drying.

HIRT (R. R.) & LOWE (J. L.). **Poria microspora in house timbers.**—*Phytopathology*, xxxv, 3, pp. 217–218, 1 fig., 1945.

Poria microspora has been found at Syracuse, New York, causing extensive decay in a new house built with the poorly seasoned timber commonly employed for such purposes under war-time conditions. The dull white fruit bodies, 3 mm. thick, of a dry, soft-papery texture, developed on the rotting pine sheathing boards after about a year in the decay cellars at the New York State College of Forestry. The tubes attained a length of 8 mm. on a sloping surface, with 2 to 2·5 pores per mm. The subiculum hyphae are provided with numerous clamps. The smooth, hyaline, oblong to oblong-ellipsoid spores measure 5 to 6 by 2·5 to 3 μ. These microscopic characters serve to distinguish *P. microspora* from the otherwise similar *Trametes serialis* [*R.A.M.*, xxii, p. 506]. Fructifications appear to be very seldom produced by the former organism, having been reported only from three widely separated localities in Canada and the United States. Infected wood has been demonstrated over a still larger area by cultures from Sitka spruce [*Picea sitchensis*] and Douglas fir [*Pseudotsuga taxifolia*] imported into Great Britain from Canada, and from the latter in Oregon and at Toronto.

AMADON (C. H.). **Ground line treatment of standing poles.**—*Bell Lab. Rec.*, xxii, 11, pp. 468–471, 4 figs., 1944.

In 1935, a total of 428 chestnut and northern white cedar [*Thuja occidentalis*] poles and posts were treated against microbiological decay at the vulnerable section, i.e., from a few inches to 12 or 15 in. below the ground-line, with a number of preservatives, of which sodium fluoride and a mixture of creosote and coal tar have proved particularly effective. The first step is to distribute 1 lb. sodium fluoride against and around the pole at the bottom of the excavation, which is then filled loosely with soil to ground-level and a trough formed round the pole by pressing the soil away from it to a depth of 10 in. With any convenient container, such as a watering can, with the sprinkler head removed and the tip of the spout flattened to pour a fan-shaped stream, 1 to 1½ gals. creosote is applied to the pole about 18 in. above ground-level. After a brief interval, the saturated soil is pressed back against the pole and back-filling is completed. A final application of ½ gal. may be given in areas where the presence of creosote on the surface of the soil is not objectionable, the liquid being poured into a shallow trough round the pole. It is estimated that this treatment will increase the service life of the poles by six years or so. It has been adopted by several of the Bell Telephone System's operating companies, one of which, in Canada, has already treated 258,000 northern white cedar poles out of 450,000 remaining in its lines.

THEDEN (G[ERDA]) & SCHULZE (B.). **Untersuchungen über die Bedeutung von Netzmitteln für die Schutzbehandlung von Holz mit wässerigen Lösungen.** [Investigations on the importance of wetting agents in the protective treatment of wood with aqueous solutions.]—*Holz Roh-u. Werkstoff*, vi, 8–9, pp. 241–245, 1 fig., 1 graph, 1943.

A tabulated account is given of experiments on coniferous sap- and heartwood at the National Material Testing Station, Dahlem, Berlin, to determine the utility of various wetting agents as adjuvants to aqueous timber preservative solutions [*R.A.M.*, xxii, p. 109]. Not only was there no improvement in the extent of penetration and absorption as a result of the admixture, but in some cases a slight and probably unimportant obstruction to the passage of the fluid was observed.

WHITE-STEVENS (R. H.) & WESSELS (P. H.). **Studies in the minor element nutrition of vegetable crop plants: I. The interrelation of nitrogen, phosphorus, potash, and boron in the growth of Rutabagas.**—*J. Amer. Soc. Agron.*, xxxvi, 11, pp. 903–921, 1944.

At the Long Island Vegetable Research Farm, Riverhead, New York, boron deficiency has been found to develop in the field even when borax applications of the prescribed magnitude have been made, the differential degrees of the trouble observed on susceptible crops being associated with, and apparently dependent on, the nitrogen, phosphorus, and potash fertility levels employed. The results are presented of a greenhouse factorial experiment on Long Island Improved rutabaga [swede: *R.A.M.*, xxii, p. 38], involving the application of nitrogen, phosphorus, potash, and boron at high and low levels, the former, in the case of the first three elements, corresponding to the concentrations used in Shive's best solution and the latter to one-tenth of this strength, while for boron the amounts were 10 and 0·1 p.p.m., respectively.

Nitrogen, phosphorus, and boron all promoted root at the expense of foliar growth, potash and boron each amplifying the nitrogen effect. Boron, nitrogen, and phosphorus, in descending order, gave significant control of boron deficiency, whereas the action of potash in this respect was definitely deleterious. Nitrogen interacted with phosphorus to enhance the deficiency and with potash and boron to reduce it. Phosphorus interacted with potash and boron to reduce the deficiency. Nitrogen, phosphorus, and potash mutually intensified deficiency symptoms, but phosphorus, potash, and boron reciprocally reduced them.

PALTI (J.). **Seed-borne vegetable diseases.**—*Hassadeh*, xxv, 2, pp. 51–53, 1944. [Hebrew.]

Alternaria spp., probably including *A. solani*, are responsible for a troublesome blight of tomato leaves, stalks, and fruits over a wide area of Palestine, the winter crop being chiefly affected. Healthy seed may be procured from summer crops thoroughly sprayed with copper fungicides, the most favourable location for this purpose being Upper Galilee. Plots affected by tomato bacterial blight (*Xanthomonas vesicatoria*), a relatively rare disease, should be excluded as sources of seed supply.

Black rot of cabbage and cauliflower (*Pseudomonas* [*X.*] *campestris*) causes enormous losses, especially in the coastal plain. It is largely soil-borne, and from preliminary trials does not appear likely to penetrate into the seeds of cauliflower plants showing foliar symptoms only. Seed crops of cabbage and cauliflower should, as far as possible, be raised in the Jordan and Esdraelon Valleys, where the disease is mild or absent; in slightly infected plots all plants showing signs of head rot should be rogued.

LEACH (J. G.) & SMITH (P. G.). **Effect of seed treatment on protection, rate of emergence, and growth of garden Peas.**—*Phytopathology*, xxxiv, 3, pp. 191–206, 1 fig., 2 graphs, 1945.

A tabulated account is given of investigations carried out in 1942 and 1943 at the California Agricultural Experiment Station to determine the relative protective values of several commercial fungicides and their effects on the emergence rate, growth, and yield of some leading pea varieties [*R.A.M.*, xxiii, p. 511].

In soil artificially infested with *Pythium ultimum*, semesan and yellow cuprocide conferred somewhat superior protection to arasan, new improved ceresan, and spergon, but the differences were not appreciable and all five preparations produced much more prolific stands of Laxton's Progress than those in the untreated control plots. For instance, in 1942, emergence in the treated plots ranged from 51·1 (0·2 per cent. arasan) to 92·2 per cent. (0·2 per cent. yellow cuprocide and 0·3 per cent. semesan), the disease index from 11·4 (semesan) to 63·6 (arasan), and the average weight per seedling (with cotyledons) from 1·35 (arasan) to 1·76 gm. (semesan), the corresponding figures for the checks being 5·6 per cent., 97·8, and 0·68 gm., respectively. In 1943, emergence in the treated plots ranged from 66·7 (0·2 per cent. spergon) to 78·7 per cent. (0·2 per cent. yellow cuprocide), the disease index from 28·3 (yellow cuprocide) to 44·7 (spergon) and average weight per seedling from 1·56 (0·2 per cent. arasan) to 2·16 gm. (yellow cuprocide), the corresponding figures for the checks being 17·3 per cent., 88, and 0·84 gm., respectively. In a single test with '604' (2, 3, dichloro-1, 4-naphthoquinone) [ibid., xxiii, p. 265] at dosages of 0·2, 0·1, and 0·05 per cent., the emergence percentages were 79, 67, and 54 per cent., respectively, compared with 47, 82, and 11 per cent. for spergon (0·2 per cent.), semesan (0·25), and control, respectively, indicating a satisfactory degree of toxicity to *P. ultimum* in the new preparation.

In similar trials in pasteurized soil inoculated with a strain of *Rhizoctonia* [*Corticium*] *solani* causing damping-off of sugar beet and beans [ibid., xxiv, p. 261], no seed decay or pre-emergence damping-off occurred on peas. None of the treatments effectively combated post-emergence epicotyl infection or cotyledon rot.

In field experiments with light or moderate infestations, principally of *P. ultimum*, all the chemicals gave adequate protection, but in some of the tests spergon and semesan proved more beneficial than yellow cuprocide or new improved ceresan, largely owing to the freedom of the two former from any deleterious effects on the plants (Laxton's Progress and Wisconsin Sweet). No evidence of chemical stimulation, as distinct from fungicidal protection, was afforded by these experiments.

WEIMER (J. L.) & LUTTRELL (E. S.). **A canker of Cowpea and Macrophomina leaf spot of Cowpea and Snap Bean.**—*Plant Dis. Reptr*, xxix, 4, pp. 127–129, 1945. [Mimeographed.]

A disease of cowpea termed stem canker caused the death of a considerable number of plants at the Georgia Experiment Station in September, 1944. The early stages were not found, but the plants available showed brick-red cankers ranging from a few mm. in diameter to practically the entire length of the stem. Infection may apparently take place anywhere on the petiole or stem so that branches only or the entire plant may be killed. A species of *Colletotrichum* with curved spores, possibly *C. caulicola* Heald & Wolf, was thought to be the agent, though a species of *Fusarium* and one of *Phomopsis* (probably *Diaporthe sojae*) were also frequently found.

Following a rainy period in September, many leaflets of an unknown cowpea variety were observed to die off from the tip towards the base. All the tissue, including the veins, appeared to be affected, becoming light brown or grey. The adjacent tissue was somewhat water-soaked and the dead grey part of the leaflet

filled with pycnidia of a fungus identified as *Macrophomina phaseoli*. Cultural studies bore out this diagnosis but inoculations were not performed. The infected leaflets soon fell off and the infection did not spread to the stems. Two weeks after the outbreak was first seen no signs of the disease could be found. Similar infections occurred on potted cowpea plants in the greenhouse, the fungus entering the stem through the petioles and killing the entire plant.

Snap beans in the greenhouse showed the typical symptoms of infection by *M. phaseoli*. In a field at Tifton the plants had been weakened by drought, and during a period of wet weather infection appeared to spread from the leaflets to the stem and cause the extensive destruction. Isolations of pycnospores from the infected leaves produced the characteristic sclerotial stage of the fungus. The crop in the field was also attacked to a lesser degree by *Phyllosticta phaseolina*.

HARRIS (M. R.) & ELLETT (C. W.). **A Penicillium disease of Soybeans.**—*Phytopathology*, xxxv, 2, pp. 144–145, 1 fig., 1945.

A species of *Penicillium*, the identity of which has not yet been determined, was consistently isolated from two types of lesions on soy-beans [*R.A.M.*, xxiv, p. 265] undergoing germination percentage tests at the Ohio Seed Improvement Association in the winter of 1943–4. In some cases the cotyledons and hypocotyls bore sunken, irregular, dark brown spots, while in others the lesions on the hypocotyls were soft, water-soaked, and darkish, those on the cotyledons being similar but exceptionally large and often causing collapse of the entire organ into a soft, pale grey mass of rotted tissue. The inoculation of seeds with broth and agar cultures of the mould resulted in retarded germination, stunting of the seedlings, distortion of the leaves and reduction to half the normal size, and sometimes in the development of lateral buds, imparting an effect of fasciation. Numerous lesions comparable to those described above were formed on the hypocotyls and cotyledonary leaves of the infected plants, from which the pathogen was readily recovered in culture. The results of preliminary varietal susceptibility trials are tabulated.

WILSON (J. D.). **Ten years of Carrot spraying with various copper-containing materials.**—*Bi-mon. Bull. Ohio. agric. Exp. Sta.*, xxix, 226, pp. 63–73, 1 fig., 1944.

During the last ten years Bordeaux mixture and one or more of the fixed copper compounds have been used in spraying experiments against carrot leaf blights (*Cercospora apii carotae* [*C. carotae*] and *Macrosporium* [*Alternaria*] *carotae*) in Ohio [*R.A.M.*, xii, p. 356], where the incidence of these diseases has been increasing for the past 15 years. In 1939 some of the materials were also used in dust form. Small plots in randomized distribution were treated at ten-day intervals with formulae usually containing 1½ to 2 lb. copper (as the metallic equivalent) in each 100 gals. spray liquid. Carrots are somewhat susceptible to spray injury, the fixed coppers in particular tending to reduce yields in the absence of the leaf blights. Bordeaux mixture (8–8– or 6–6–100) consistently gave equal or superior control to any of the fixed coppers with which it was compared, being placed at the head of the list in seven out of 13 tests including both types of fungicide. The yield differences between plots treated with the several fixed coppers were seldom of significant magnitude, but in the case of tribasic the balance between disease control and host injury was generally more favourable than with the other materials. Cuprocide, for example, usually produced smaller harvests than the other fixed coppers on account of foliar injury and should probably be applied to carrots at lower concentrations than those recommended for Bordeaux or most fixed coppers.

Whenever 50 per cent. or more of the foliage had been destroyed by the leaf blights at the time of the last treatment, Bordeaux mixture and many of the fixed coppers would show a significant increase in yield. On the other hand, if defoliation in the check plots amounted to less than 10 per cent. at harvesting, the yields from the treated plants were usually lower, in some cases significantly so, than those from the controls, the differences being more marked on upland than on muck soils. In the 12 experiments in which the data warranted statistical analysis, the least significant difference in yields averaged about 10 per cent. of the harvest from the control plots. Moreover, the weight of the treated carrot tops was often two or three times heavier than that of the untreated, while crown rot (*Erwinia carotovora*) was usually less prevalent in the protected than in the check plots.

The admixture of wheat flour and other adhesives as adjuvants to carrot sprays appeared to be of doubtful value, and they were therefore omitted from many of the later trials, but wetting agents (mostly turgitol) were included throughout the experimental period. Cupro K and copper hydro 40 were finally discarded by reason of their general unavailability on the market and relatively high cost on the basis of metallic copper equivalent. Spraying was found to be rather more practical than dusting for the control of the carrot leaf blights, but further comparative experiments are necessary to establish a definite ruling in this sense. The very narrow margin between disease control and host injury in carrots is probably one reason for the superiority of Bordeaux over the fixed coppers at comparable dosages as a means of increasing yields. Fermate (3– and 2–100), used only in 1942 and 1943, gave satisfactory control of the two pathogens but caused mild foliar damage; sulphur proved ineffectual in the few tests made with it. It is inadvisable to reduce the copper content of carrot sprays below a metallic copper equivalent of $1\frac{1}{2}$ lb. per 100 gals. There is little advantage in reducing the interval between spray treatments to less than nine days.

The leaf blights were adequately controlled by the lower (6–6–100) of the two above-mentioned Bordeaux formulae. A number of the fixed coppers with a 50 per cent. copper content may be used at a dosage of 3 lb. in 100 gals. The first application should be made when the tops are 4 to 6 in. high and repeated at 10-day intervals until a fortnight or so before harvesting.

ARK (P. A.). **Crater rot and blotch of Celery, a new aspect of soft rot caused by Erwinia carotovora.**—*Phytopathology*, xxxv, 2, pp. 140–142, 1 fig., 1945.

Besides heart rot [*R.A.M.*, vii, p. 218], *Erwinia carotovora* has been found to cause a destructive disease responsible for heavy losses in commercial celery fields in the Delta region of California. Small, watery spots, subsequently turning straw-coloured to brownish and later becoming sunken, dark brown, and sharply delimited, appear near the petiole bases. Sometimes the lesions are merely superficial, resulting in a blotchy appearance, in contrast to the deeper, soft, watery rot. Ultimately the infected tissues dry out and collapse into concave, crateriform depressions. Badly diseased plants are useless for export and the outer large petioles have to be stripped off. The practice of leaving infected stalks in the field causes heavy infestation of the soil with the crater-rot bacteria, and may account for the extension of the disease following repeated crops of celery on the same site.

Black stem and rust quarantine (quarantine No. 38).—U.S.D.A., B.E.P.Q., 4 pp., 1944.

A revision, effective as from 26th December, 1944, of the black stem rust quarantine No. 38 adds Washington to the list of States that are being protected against *Puccinia graminis* by restricting the movement thereto of susceptible species of barberry and *Mahonia*.

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LUTTRELL (E. S.). **Additional hosts of Diaporthe sojae.**—*Plant Dis. Reptr*, xxix, 3, pp. 89–90, 1945. [Mimeographed.]

During 1943 and 1944, in several localities in Georgia *Diaporthe sojae* was observed on soy-beans, groundnuts, snap beans, and Lima beans [*Phaseolus lunatus*], the two last being new hosts. There is little evidence that *D. sojae* is strongly pathogenic on any of these four crops. It was observed chiefly on senescent or weakened plants and was almost constantly associated with other fungi, notably *Macrophomina phaseoli*. A field of snap beans in which 40 per cent. of the plants were infected was still bearing, the chief infection being on dead pedicels, and at most *D. sojae* appears to be only a weak parasite.

MILLER (P. W.) & MCWHORTER (F. P.). **Studies on the control of Onion smut by seed treatments in Oregon.**—*Plant Dis. Reptr*, xxix, 3, pp. 93–94, 1945. [Mimeographed.]

In tests in the greenhouse of the dusts thiosan, arasan, fermate, and ceresan applied to onion seed for the control of smut (*Urocystis cepulae*), some significantly reduced infection of the seedlings but none was consistently as effective as the standard treatment with formaldehyde solution (1 in 100 by volume). In a field trial not only did none of the dusts give satisfactory control, but the sticking agent tended to clog the seeder and give uneven stands. The formaldehyde was less efficacious in the field (34·2 per cent. smutted seedlings).

DILLON WESTON (W. A. R.). **Leaf spot of Celery.**—*J. Minist. Agric.*, li, 12, pp. 561–563, 9 figs., 1945.

This is a brief, popular account of celery leaf spot (*Septoria apii* and *S. apii-graveolentis*) [*R.A.M.*, xxii, p. 236; xxiii, p. 285] illustrated by a chart. In England, *S. apii-graveolentis* is the more common and injurious of the two fungi.

HANSEN (H. N.) & TOMPKINS (C. M.). **The name of Ansatospora macrospora.**—*Phytopathology*, xxxv, 3, pp. 218–220, 1945.

In connexion with the application to the celery storage rot fungus by Newhall of the name *Ansatospora macrospora* [*R.A.M.*, xxiii, p. 324], it is pointed out that Hartig described the identical organism in 1880 (*Untersuch. forst.-bot. Inst. München*, i, pp. 58–61) as *Cercospora acerina*, the agent of a maple [*Acer*] seedling disease. The name was subsequently changed by Frank (*Krankheiten der Pflanzen*, Vol. ii, 1896) to *Sporidesmium acerina*, and by Arnaud to *Cercosporella acerina* (*Bull. Soc. Path. vég. Fr.*, v, pp. 58–60, 1918). Like Osterwalder, who found the same pathogen attacking pansy and named it *Cercospora macrospora* [*R.A.M.*, iv, p. 288], Hartig failed to recognize the nature of the conidial appendages, which are clearly shown in the illustrations of both authors. On the basis of priority, therefore, the fungus should in future be known as *Ansatospora acerina* (Hart.) nov. comb., its synonyms being *C. acerina* Hart., *S. acerina* (Hart.) Frank, *Cercosporella acerina* (Hart.) Arnaud, *Cercospora macrospora* Osterw., *C. cari* Westerd. & Van Luijk, and *A. macrospora* (Osterw.) Newh.

THOMAS (C. A.). **Studies on the Fusarium-wilt disease of Sweet Potato (Ipomoea batatas Poir).**—*Proc. La Acad. Sci.*, vii, pp. 23–24, 1942. [Received April, 1945.]

No loss in virulence was observed in 12-year-old cultures of *Fusarium batatatis* [*F. bulbigenum* var. *batatas*] and *F. hyperoxysporum* [*F. oxysporum* f. 2], the agents of sweet potato wilt in Louisiana, where the former species is the more prevalent and pathogenic. *F. bulbigenum* var. *batatas* imparted a powdery aspect to potato cylinders, and when the stroma covering the medium shrivelled, many small, blue blisters of sclerotial plectenchymata appeared. On the same substratum *F. oxysporum* f. 2 first produced an abundance of white mycelium and on desiccation assumed a gelatinous aspect. *F. bulbigenum* var. *batatas* gave rise to powdery, orange colonies on rice, followed at an advanced stage by dark blue to purple blisters, while the growth of *F. oxysporum* f. 2 was dark red, turning blue later.

BAWDEN (F. C.). **Plant viruses and virus diseases.**—*Nature, Lond.*, clv, 3928, pp. 156–158, 1945.

In this paper (based on two lectures at the Royal Institution on 21st and 28th November, 1944) the author discusses the meaning of the term 'virus disease', the effects of such diseases on plants, the manner in which infection takes place, and the application of the technique of protein chemistry to the purification of certain viruses. [Reprinted in *Trop. Agriculture, Trin.*, xxii, 5, pp. 89–92, 1945.]

HILDEBRAND (E. M.). **The Dodder vector of woody plant viruses.**—*Plant Dis. Reptr*, xxix, 7, pp. 196–197, 1945. [Mimeographed.]

In preliminary experiments towards the end of 1940, the writer succeeded in the transmission of the cucumber mosaic virus from its own host to cucumber, but not from cucumber to peach, with the aid of four species of dodder [*R.A.M.*, xxiv, p. 136], of which *Cuscuta subinclusa* and *C. campestris* were uniformly effective, while *C. californica* and *C. repens* gave positive results in some of the tests and failed in others. Attempts in the spring of 1941 to convey a number of peach viruses from their own host to tomato by means of *C. campestris* were successful only with X-disease and rosette viruses, but the results of tests on the re-transmission to peach were negative or inconclusive. All experiments in the transmission of the same viruses from peach to peach failed. In 1943 the studies on dodder transmission were handed over to G. W. Cochran, who repeated and confirmed the writer's observations on the passage of rosette from peach to tomato and those of Kunkel on the conveyance of the same virus from peach to periwinkle (*Vinca rosea*). It is important that the limitations of dodder as an agent of transmission from woody to herbaceous plants should be recognized.

WATERSTON (J. M.). **Plant diseases and pests.**—*Rep. Dep. Agric. Bermuda, 1944*, p. 7, 1945.

The disease of the Bermuda cedar [*Juniperus bermudiana*] described by the Plant Pathologist in his report for 1943 [*R.A.M.*, xxiv, p. 51] spread during the year. At least three pests have now been suggested as possible causes of the trouble. Pending entomological investigation, the trees have been thinned and cleared of underbrush and vegetation to give more air and strengthen them against attack.

Phytophthora parasitica damaged the Easter lily (*Lilium longiflorum*) crop considerably during the autumn rains. Bud rot, provisionally attributed to *Phytomonas cannae*, was recorded for the first time on flowering stems and root stocks of *Canna* causing minor damage. *Sclerotinia sclerotiorum* badly rotted flowering stems of roselle (*Hibiscus sabdariffa*); young citrus trees were treated for manganese and zinc deficiency with nutritional sprays. Melanose caused by *Diaporthe citri* was found severely damaging grapefruit in dense shade, and wither tip of lime caused by *Gloeosporium limetticola* was also recorded.

Box (H. E.). **Insect transmission of the 'swollen-shoot' virus in West African Cacao.**—*Nature, Lond.*, clv, 3942, pp. 608–609, 1945.

In studies at Tafo, Gold Coast Colony, on the insect transmission of cacao swollen shoot [*R.A.M.*, xxiv, p. 11], successful results were obtained with strain I of the virus, using the mealy bugs *Ferrisiana virgata* and *Pseudococcus exitiabilis*, with strain II using *P. exitiabilis*, and with strains III and IV separately, using *P. citri*.

Strain I, a virulent strain, is characterized in the plant by pronounced swellings in the recent ligneous growth, a typical foliage mosaic particularly noticeable in the newest leaves appearing after infection, and by death of the tree within eighteen months in the case of plants infected when less than two years old. Strain II, non-virulent, produces swellings only, or at most an indeterminate chlorosis, not always present, in the foliage. Strain III, non-virulent, produces mottling only, the pattern being distinct from that of strain I. Strain IV, non-virulent, produces a mosaic of the feather type, quite distinct from that produced by strains I and III.

It appears that more than one distinct virus may be concerned. The first recognizable symptoms appeared five weeks after the transfer of insects from affected plants. It was found that strain I could be transmitted by a single individual female of *P. exitiabilis*, and by this insect in its crawler stages. In one case, transmission occurred through females of the species, which had lived on the infected source plant for not over 48 hours. To ensure transmission, however, a minimum of ten females, preferably with accompanying larvae, is advised.

Thren (R.). **Gedanken zum Wirkstoffproblem in der Mikrobiologie.** [Reflections on the growth substance problem in microbiology.]—*Kühn-Arch.*, lx, pp. 253–264, 1 fig., 1 graph, 1944.

Reference is made to some recent studies on the vitamin requirements of fungi, and the writer's experiments on the development of haplont cultures of *Ustilago avenae* on a synthetic medium with and without aneurin [vitamin B_1] are tabulated and discussed. Although the smut was capable of growth, even at a very low rate of seeding (100 cells per 10 c.c.), in the absence of the accessory factor, its development was much more abundant when vitamin B_1 was added to the medium. Thus the mycelial weights of the four haplonts of a tetrad at the high seeding rate of 20,000 sporidia per 20 c.c. ranged from 6·1 to 13·7 mg. without vitamin B_1 and from 15·4 to 28·2 mg. with it, the corresponding figures for the low rate being from 3·7 to 9·2 and from 9·1 to 18·8 mg., respectively.

In a previous paper (*Arch. Mikrobiol.*, xii, p. 192, 1941) the author described at length the results of his experiments on the vitamin B_1 requirements of barley loose smut (*U. nuda*) in the dicaryophase, which presented a number of parallels with those of N. Fries on *Daedalea unicolor* [*R.A.M.*, xviii, p. 335], including the temporary cessation of growth, followed by a renewed impetus in the presence of the accessory substance at a dosage of 0·1 γ per 20 c.c. These and other anomalies are tentatively ascribed to divergences in the vitamin B_1 demands of the two haplonts in the combination, one of which is assumed to be heterotrophic and the other autotrophic in this respect.

It was ascertained that the inequalities in the vitamin B_1 content of the three barley varieties, Morgenrot (highly susceptible to loose smut), Heils Franken (moderately susceptible), and Nepal (very resistant), are too slight to account for the differences in their reaction to the disease.

Lasser (E.). **Das Sortenproblem im alpinen Pflanzenbau.** [The variety problem in Alpine plant organization.]—*Kühn-Arch.*, lx, pp. 358–368, 1944.

Alpine climatic conditions are highly conducive to fungal diseases in most cereal crops, causing losses of up to 100 per cent. The two most destructive are snow

mould (*Fusarium*) [*Calonectria graminicola*] and black rust [*Puccinia graminis*]. Rye ordinarily enjoys the reputation of comparative freedom from fungal diseases, but this observation does not apply in Styria. The Tauern winter variety is highly resistant to *C. graminicola* and fairly so to *P. graminis*; Schlägler is sufficiently resistant to snow mould, but susceptible to rust; Lurnfelder is less resistant to snow mould than the foregoing, but more so than most other varieties, and its pseudo-resistance (escape through early maturity) to rust is of great importance. Rust resistance is also the decisive factor in the cultivation of summer rye. Both in the winter and summer forms the indigenous varieties proper to almost every province should provide fruitful sources of rust-resistant (-escaping) material for crossing.

The popular Plantahof winter wheat shows adequate resistance to *P. graminis* and on this account usually gives abundant yields, but it is susceptible to cold and lodges easily. Crosses have been made between this variety and some of the Halle Plant Breeding Station selections from Thatcher [see next abstract].

Of minor importance generally in the Alps are black and crown rusts of oats [*P. g. avenae* and *P. coronata*], yellow and brown rusts of wheat [*P. glumarum* and *P. triticina*] and rye [*P. glumarum* and *P. secalina*], and dwarf rust of barley [*P. anomala*]. Wheat bunt [*Tilletia caries* and *T. foetida*] is virtually absent, or the rapid spring growth of the plants enables them to escape its attacks. Loose smut [*Ustilago tritici*] is fairly often encountered, though not to the same extent as in most parts of Germany, probably for a similar reason. Mildew [*Erysiphe graminis tritici*] also occurs in a mild form. Maize smut [*U. maydis*] is not exceptionally troublesome, but a heavy outbreak of rust [*P. maydis*] took place in 1942.

POLLACK (FLORA G.). **Fungi found on imported Australian Wheat.**—*Plant Dis. Reptr*, xxix, 8, pp. 213–214, 1945. [Mimeographed.]

The author records the results of an examination of five shiploads of Australian wheat by the Plant Quarantine officers at San Pedro, California. Three shiploads revealed seven small specimens of leaf fragments carrying flag smut (*Urocystis tritici*). Other fungi carried were *Puccinia rubigo-vera* var. *tritici* [*P. triticina*] in 17 cases, *P. graminis tritici* in five, *Tilletia caries*, *T. foetida*, and *Ascochyta graminicola* in one each, *Phoma lophiostomoides* in seven, *Selenophoma* sp. in five, wheat being apparently a new host for this fungus, and *Septoria tritici* in 17. A fragment of smutted barley spike represented apparently a specimen of *Ustilago hordei*.

CLARK (J. A.). **Registration of improved Wheat varieties, XVI, XVII.**—*J. Amer. Soc. Agron.*, xxxvi, 5, pp. 447–452, 1944; xxxvii, 4, pp. 314–318, 1945.

Four further wheat varieties were approved for registration in 1943 [cf. *R.A.M.*, xxii, p. 25] and the same number in 1944. Fairfield (Reg. No. 332), developed at the Purdue (Indiana) Agricultural Experiment Station from a cross between Purkof and Fulhio made in 1926, is a soft red winter wheat with excellent resistance to loose smut [*Ustilago tritici*] and mosaic, as well as to cold and winter-killing.

The durum varieties Carlton (Reg. No. 333) and Stewart (Reg. No. 334), both from the North Dakota Agricultural Experiment Station, are superior to Mindum and Kubanka in resistance to stem rust [*Puccinia graminis*]; the former is a selection developed in the course of a programme of back-crossing Vernal emmer to Mindum durum, while Stewart was derived from the progeny of Mindum × Vernal emmer back-crossed to Mindum.

The hard red spring Newthatch (Reg. No. 335), produced at the Minnesota Agricultural Experiment Station by back-crossing between Thatcher as the recurring and Hope as the non-recurring parent, closely resembles Thatcher in plant and kernel type, but excels it in yield and in resistance to leaf [*P. triticina*] and stem rusts.

The soft red winter Sanford (Reg. No. 336) was selected at the Georgia Experi-

ment Station from a P1068 × Purplestraw backcross. It is moderately resistant to *P. triticina* and more prolific than Purplestraw. Some 45 per cent. of the Georgia wheat crop in 1943–4 consisted of Sanford, which is also grown in Alabama and South Carolina.

Mida (Reg. No. 338) was derived at the North Dakota Agricultural Experiment Station from a Ceres-Double cross (R.L. 625) × Mercury cross. It is a hard red spring wheat, resistant to both stem and leaf rust, as well as to bunt [*Tilletia caries* and *T. foetida*], and yields well.

Orfed (Reg. No. 339) is a bunt-resistant white wheat developed at the Washington Agricultural Experiment Station from an Oro × Federation cross.

CHESTER (K. S.) & LARSH (H. W.). **Forecast of serious Wheat leaf rust epiphytotic.** —*Plant Dis. Reptr, Suppl.* 156, pp. 142–144, 1945. [Mimeographed.]

During 1944–5, exceptionally favourable late winter and early spring weather in Oklahoma permitted such an increase in wheat leaf rust (*Puccinia rubigo-vera* var. *tritici*) [*P. triticina*] that a severe epiphytotic, perhaps equal in intensity to that of 1938, is expected. On 1st April, at the end of the 'critical month' [cf. *R.A.M.*, xxi, p. 481; xxiv, p. 11] and the beginning of the period when temperatures and moisture are regularly favourable for rust reproduction in Oklahoma, there was more than 17,000 times as much rust present as on a corresponding date in the light rust year, 1944. This intensity and a marked increase in the following ten days were associated with the fact that on 23 of the previous 24 days the temperature for a large part of the day was between 60° and 65° F., which is an optimum for rust reproduction. Spores were being deposited on traps at Stillwater in March, 1945, with a frequency that was not reached until mid-May in 1944.

Only on one day in February and March, 1945, when observations were taken every ten days, was there any marked decrease in infection. This was on 11th March, and was due to a temperature of 21° on 6th and 7th March, which destroyed the heavily rusted leaves, and reduced foliation from an average of 5 to 3½ leaves per tiller.

In the event of a rust epiphytotic, however, the substantial acreages of moderately resistant varieties, such as Comanche, Austin, Pawnee, and Westar now under cultivation in the south-west may demonstrate their value.

WELLS (J. G.), CLANAHAN (D. L.), & CHURCHILL (B. R.). **Regent Wheat for the Upper Peninsula.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxvii, 3, pp. 298–300, 1945.

The authors claim that Regent beardless red spring wheat, derived from H 44 (Marquis × Vernal Emmer) and Reward (Marquis × Prelude), is highly resistant to stem and leaf rusts [*Puccinia graminis* and *P. triticina*], is stiff-strawed, and meets market and feeding requirements on the Upper Peninsula. Yield tests in 1941 gave Regent 32·4 and Thatcher 19·8 bush. per acre, while in 1944, nine of 17 farmers testing Regent wheat harvested 30 bush. per acre and over.

CRAIGIE (J. H.). **Epidemiology of stem rust in Western Canada.**—*Sci. Agric.*, xxv, 6, pp. 285–401, 6 figs., 2 diags., 1 graph, 4 maps, 1945.

In this detailed account of an investigation (part of which was begun in 1918) into the epidemiology of wheat stem rust (*Puccinia graminis*) in Western Canada, the author states that the disease regularly appears in southern Manitoba, usually in the Red River Valley, first, and farther to the north and west afterwards. In Manitoba it occurs in late June or early July, whereas in Alberta its appearance is a month or more later. The area most severely affected comprises Manitoba and eastern Saskatchewan. There are virtually no local sources of infection. Barberry had been eradicated before the investigation began and no case of overwintering

has ever been established, though a small percentage of uredospores may occasionally survive the winter. All spore viability appears to have been lost before the new growth of grasses or cereals becomes available for infection. Inoculum is nearly always present in the air over Manitoba, usually first over the Red River Valley, before it is present over Saskatchewan, and over Saskatchewan before it is present over Alberta. In any district, inoculum has always been found present in the air in advance of infections in the field. The initial inoculum consists largely, if not wholly, of spores originating outside Western Canada, though from time to time subsequent spore invasions arrive to increase the locally-produced inoculum that has arisen from infections by the earlier wind-borne spores. The similarity, each year, in the amount of infection and in the physiologic races present in Western Canada and the Northern Mississippi Valley indicates that most of the wind-borne inoculum originates in the latter area.

An evident association exists between years of high spring and summer rainfall and years of medium and heavy infection, dependent, apparently, mainly on the amount of inoculum present. The excess rainfall of the years of medium and heavy rust over that of years with light rust is spread over the period April to August, the April to May and the July rainfall being, however, more consistently above the average than the June and August rainfall. Years with a more than average number of days with rain in spring and summer seem to be associated with years of medium and heavy infection, this association depending, apparently, on the amount of available inoculum. The frequent occurrence of nights with heavy dew in Western Canada is an important factor in promoting infection.

During the growing season, the mean temperature in Western Canada tends to be slightly higher in light than in heavy rust years, but somewhat lower than in medium rust years. The mean July temperature, however, in the area of severe rust was rather higher in the heavy than in the light rust years. The mean minimum temperature for the period 20th June to 4th August, when infection develops and spreads most rapidly, was rather higher in the heavy and medium than in the light rust years. The main effect of the lower minimum temperature in the light rust years is probably to retard rust development rather than to decrease the number of infections.

In Manitoba there was a close association between the occurrence of a south wind and that of high stem rust and leaf rust (*P. triticina*) spore concentrations in the air from 12th June to 20th July. This association was less apparent in Saskatchewan and seemed largely to disappear in Alberta. On the whole, winds favouring the introduction of spores into Western Canada did not appear to be more frequent or more lasting in heavy than in light rust years.

Factors contributing to the occurrence of more frequent and severe outbreaks of stem rust in Manitoba and eastern Saskatchewan than in western Saskatchewan and Alberta include the closer proximity of the first two areas to the source region of inoculum, the greater number of hours there during which winds blew that favoured the introduction of inoculum, and higher rainfall and temperature of these areas.

The data of appearance of field infections appears to be determined by the date of inoculum arrival and subsequent weather conditions. To a considerable degree, the establishment of epidemic conditions appears to depend on the early arrival of a copious supply of wind-borne inoculum. In medium rust years, wind-borne inoculum became plentiful much later than in heavy rust years, and in light rust years it was, with one exception, not abundant at all, or became so only late in the season.

As regards the length of time required for the crop to mature, there was little, if any, difference between heavy and light rust years. In heavy rust years, however, seeding was generally a few days later than usual, and as infection appeared at

about the usual time and increased rapidly, the crop became subjected to severe attack during most of its fruiting period. In medium rust years, moderate to severe infection was established only after the fruiting period of most of the crop was at least half completed. The popular view that heavy infection is often preceded by a period of moist, warm weather appears to be in keeping with the evidence.

PUGSLEY (A. T.). **Breeding for bunt resistance in Australian Wheats.**—*J. Aust. Inst. agric. Sci.*, xi, 1, pp. 28–34, 1945.

Studies carried out in South Australia since 1939 to determine the relative resistance to bunt (*Tilletia levis* and *T. tritici*) [*T. foetida* and *T. caries*] of the newer Australian wheat varieties in comparison with older varieties and others from America, using a mixed inoculum consisting of various races of fungi, consistently showed that the Australian varieties were not more resistant than Florence. All the Hope crossbreds tested were susceptible. Warigo (Nabawa × Hope) was rather more resistant than Nabawa but more susceptible than Hope. Many of the American varieties tested were resistant, and some of these have been used by Australian breeders, but their resistant genes have not yet been incorporated in commercial varieties. That varieties known to be resistant to certain races of bunt, such as Albit, Martin, and White Federation 38, should have proved susceptible in the author's experiments indicates the presence in Australia of races able to infect them. With these varieties, the infection figure of 20 to 30 per cent. was raised to 70 to 80 per cent. by re-inoculations from infected plants of the same variety. Similar attempts to raise the infection rating for varieties such as Hope, Rio, Oro, and Florence failed, indicating the absence of races capable of attacking these wheats severely. The tetraploid wheats tested, except Doubbi, were quite susceptible. In trials at the Waite Institute, Doubbi has always remained immune from bunt, flag smut [*Urocystis tritici*], and loose smut [*Ustilago tritici*], and is being used in crosses with *vulgare* wheats. Rye remained immune from bunt in all tests, and of two wheat-rye hybrids tested, Secalotricum 144 was immune, while Secalotricum 200 was fully susceptible.

Nine collections of *T. foetida* from South Australia were found to correspond with Rodenhiser and Holton's race L–1 [*R.A.M.*, xvii, p. 165], as did a bulk collection from Temora, New South Wales. Three other collections of *T. foetida* were examined. One, derived from a single plant of Selection 1403, resembled race L–3, the second, from a single plant of Martin, resembled L–4, and the third, a bulk collection from Sydney, also resembled L–4.

Of three collections of *T. caries*, one, from a single head of White Federation, resembled T–5 or T–7, the second, from a single head of Ranee, resembled T–2 except for the intermediate reaction of Mindum, and the third, a bulk collection from Western Australia, appeared to resemble Ranee.

In the bunt-resistance breeding work in progress, Oro has been selected as the main parent, as it is susceptible only to race L–8 and has always been highly resistant to the Australian races tested. Preliminary tests have shown it to possess a major gene for resistance to the local race L–1. Using Oro, White Federation 38, and Selection 1403 (the two last-named also being resistant to L–1) as parents in crosses with other varieties, a number of F_3 lines homozygous-resistant to L–1 have been obtained. Preliminary tests showed Doubbi to possess a major gene for resistance, and *vulgare*-like resistant lines have been obtained from (Ranee × Doubbi) × Ranee, which are being used as parents in further back-crosses.

LITZENBERGER (S. C.). **Compana and Glacier Barley. Two new varieties for Montana.**—*Bull. Mont. agric. Exp. Sta.* 422, 17 pp., 1 fig., 1944.

Two superior barley varieties, Compana and Glacier, have been released by the Montana Agricultural Experiment Station, the former designed to replace Horn

on non-irrigated lands and the latter as a substitute for Trebi on irrigated and relatively moist non-irrigated soils. The average percentages of covered smut (*Ustilago hordei*), the most destructive disease of the crop in the State, over the period from 1940 to 1942 in Glacier, Compana, Trebi, and Horn were 0·0, 5·7, 15·1, and 9·8, respectively. Glacier has been observed to be susceptible to loose smut (*U. nuda*), but no infected plants were found in Compana.

YU (T. F.). **Reaction of improved Millet varieties to infection with downy mildew (Sclerospora graminicola Schroet.)**—*Chin. J. sci. Agric.*, i, 3, pp. 199–203, 1944. [Chinese summary.]

From 1934 to 1936 inclusive, inoculation experiments were carried out at Nanking to determine the reactions to downy mildew (*Sclerospora graminicola*) of five improved foxtail millet [*Setaria italica*: *R.A.M.*, xviii, p. 174] varieties, namely, Tsinan-Nanking No. 2, Kaifeng No. 48, and Nanking Nos. 19, 26, 60, the resistance of which to kernel smut (*Ustilago crameri*) had previously been established [ibid., xvi, p. 741]. Only the first-named proved to be resistant to downy mildew, with an average incidence for the three-year period of 5·7 per cent., the corresponding figures for the other varieties in the foregoing order being 11·6, 16·2, 22·9, and 12·7 per cent., respectively, and for a susceptible variety used as a control 34·4. Tsinan-Nanking No. 2, moreover, remains highly resistant even when sown in a naturally infested field, under which conditions the moderately resistant Kaifeng No. 48 produces a certain number of diseased plants. The former may safely be distributed in the regions of North China where downy mildew is widespread and destructive, whereas the latter requires further improvement for this purpose.

HALMA (F. F.), SMOYER (K. M.), & SCHWALM (H. W.). **Rootstock in relation to quick decline of Citrus.**—*Calif. Citrogr.*, xxx, 5, pp. 150–151, 1 diag., 1945.

The authors consider that quick decline, the sudden wilting of foliage and eventual breakdown or death of Navel and Valencia orange trees, is confined to sour orange rootstocks [*R.A.M.*, xxiii, p. 483]. In orchards where there are declined trees on sour stock, trees on sweet stock have been found unaffected. Susceptibility of trees on sour stock and resistance of trees on sweet stock may tentatively, therefere, be assumed as reasonable. The relatively small number of trees on grapefruit stock do not show signs of this disease, which may suggest a quality of resistance in this stock. In three orchards on [*Poncirus*] *trifoliata* stock no disease was observed though a few on sour stock have become affected. In one orchard lemon trees were unaffected, whereas Navel and Valencia orange trees wilted considerably. Three methods were used in identifying the rootstock species, viz., (1) rootstock sprouts, (2) the type of bud union, and (3) the chemical method (*Plant Physiol.*, iv, pp. 265–268, 1929).

CAMP (A. F.). **Relatório de observações científicas no Brasil.** [Report of scientific observations in Brazil.]—*Bol. Curs. Aperf. Espec.* 1, 18 pp., 1943. [Received May, 1945.]

During a visit to Brazil, the author (Horticultural Director of the Citrus Experiment Station, Lake Alfred, Florida), made a number of observations in the States of Rio de Janeiro and São Paulo relating to the form of root rot associated with the maladjustment of the sour orange stocks to the prevailing climatic and soil conditions, regarded as the most plausible explanation of the trouble [*R.A.M.*, xxiv, pp. 98, 227], and on the mineral deficiencies of citrus, notably zinc (which was widespread in all the areas inspected), copper, and phosphorus.

The zinc and manganese contents of the soils in all the coffee plantations visited were inadequate.

DASTUR (R. H.), SINGH (M.), & SINGH (S.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. XII. Further experiments on the amelioration of tirak.**—*Indian J. agric. Sci.*, xiv, 3 pp. 181–195, 1944.

This paper presents in detail the results of many years' experiments on tirak disease of cotton in the Punjab [*R.A.M.*, xxiv, p. 227]. At the fruiting stage extra water reduces tirak and gives higher yields on soils with saline subsoils, where nitrogen is quite ineffective. Nitrogen reduces tirak and raises yields on light, sandy, non-saline soils, where the response to heavy watering is small.

On sandy soils which are deficient in nitrogen but have saline or alkaline subsoils, nitrogen does not assist the opening of bolls, though it encourages bearing. American cottons sown in May are liable to tirak, June sowing gives better yields, provided that close spacing is carried out. Late sowing is a measure of great practical value because it is very difficult for a zamindar to distinguish the soil conditions causing tirak. Two schedules have been drawn up giving details of the seed rate and spacing in relation to the sowing date and of the optimum sowing dates in different districts of popular varieties.

KARLING (J. S.). **New Lagenidiaceous parasites of rotifers from Brazil.**—*Lloydia*, vii, 4, pp. 328–342, 107 figs., 1944.

In the course of a study on the Chytrids of Brazil (*Bull. Torrey bot. Cl.*, lxxi, 4, pp. 374–389, 1944; *Amer. J. Bot.*, xxxi, pp. 254–261, 1944), the author observed three new Lagenidiaceous parasites of rotifers in water and soil samples collected in various regions of the Amazon Valley, namely *Lagenidium microsporum*, *L. parthenosporum*, and *L. distylae*, all on *Distyla* sp., and the second also on *Philodina* sp., *Chaetonotus larus*, and *Heterodera* sp.

DRECHSLER (C.). **Several additional Phycomycetes subsisting on nematodes and amoebae.**—*Mycologia*, xxxvii, 1, pp. 1–31, 4 figs., 1945.

Continuing his earlier studies [cf. *R.A.M.*, xxiii, p. 485], the author gives a full account of four new species of Phycomycetes, namely *Cochlonema intercalaris* capturing nematodes, *C. ozotum*, destructive to the protozoan *Sphenoderia dentata*, and *Stylopage minutula* and *Acaulopage dichotoma* capturing amoebae.

MILLIKAN (C. R.). **A 'false' browning reaction to rust (Melampsora lini) infection in Flax.**—*J. Dep. Agric. Vict.*, xliii, 2, pp. 83–91, 10 figs., 1945.

A browning on flax identical with the disease called 'false' browning in New Zealand [*R.A.M.*, xxiii, p. 437] occurred in a severe form in the Strathkellar and Kooweerup districts of Victoria and in a milder form elsewhere. There appeared to be no relation between time of sowing and subsequent development of browning in five crops investigated. The disease first appeared in well-grown crops up to 30 or 40 in. or more high, about the beginning of November before the plants begin to ripen off, and affected both the varieties Concurrent and Liral Crown.

'False' browning patches may be only a few square yards in area and the disease develops simultaneously in a few days over the whole patch, no spread taking place subsequently to adjacent plants. Diseased plants in the mass show a brick-red colour, which is not typical of plants affected by browning disease due to *Polyspora lini* [ibid., xxi, p. 334]. The elongated, reddish-brown discolorations on the stems are usually confined to the upper half of affected plants. Individual lesions usually coalesce so that the whole of the upper portion of the stem is affected. The border is not obviously darker than the remainder and thus serves further to distinguish this disease from *Polyspora* browning. On the leaves the lesions are darker in colour, and where a large area is affected the leaf becomes twisted and drops off. Leaf lesions are often the only manifestation of the disease and often in mild cases no obvious discoloration can be detected. 'False' browning lesions occur usually

round rust (*Melampsora lini*) pustules which are abortive and white in colour due to a complete absence of uredospores. Badly affected plants produce little or no seed, but the effect on fibre yield and quality is not known at present.

In each case reported the disease occurred about a week after sudden hot spells with shade temperatures of 80° F. or over. Lesions identical in appearance with those of natural 'false' browning have been produced around rust pustules on the leaves and stems of plants subjected to a constant temperature of 37° C., and a relative humidity of approximately 85 per cent. for periods of from 6 to 30 hours. The browning was well developed approximately three days after this treatment. The most vigorous reactions occurred around very immature uredospore pustules and after the longest exposures to the heat treatment. Little 'false' browning occurred round teleutospore pustules, although such pustules lost the uredospores remaining in the centre and becoming abortive. The heat treatment had no effect on the uninfected tissues of the plants. Histological studies showed that the appearance of tissues affected with 'false' browning in artificially heated and natural specimens was identical. The browning was due to necrosis of the cells associated with a dense mycelial infection. The tips of the hyphae were often swollen to form miniature bodies which, except for their size, resembled uredospores or teleutospores. No such bodies were detected in normal rust-infected leaf tissue.

McCallan (S. E. A.). **Evaluating fungicides by means of greenhouse Snapdragon rust.**—*Contr. Boyce Thompson Inst.*, xiii, 8, pp. 367–383, 5 graphs, 1944.

In this paper the author describes a greenhouse method devised to evaluate the properties of foliage fungicides against snapdragon (*Antirrhinum niger*) [*A.* ?*majus*] rust (*Puccinia antirrhini*), the technique employed being the same as with tomato foliage diseases [*R.A.M.*, xxiii, p. 34]. The potted plants (Cheviot Maid Supreme variety) were trained to twin stems and were found to be at their best for testing when 12 in. tall. The total number of pustules per 20 leaves was counted, these leaves being composed of the five adjacent paired leaves on each stem showing the greatest number of pustules. The optimum time for counting was ten days after inoculation. There was little difference in the amount of infection that occurred between 5° and 20° C., and no significant difference between 10° and 15°. Satisfactory tests may be made within the former range. Spores were obtained from vigorous, unsprayed, previously infected plants, a concentration of 100,000 spores per c.c. producing about 300 pustules per 20 leaves.

In tests with Bordeaux mixture, cuprocide, Tennessee copper 34, lime-sulphur, flotation sulphur, mike sulphur, fermate, thiosan, and spergon, the dosage response curves plotted as straight lines on logarithmic probability paper. Empirical probit weights were obtained not significantly different from those previously calculated for greenhouse tomato diseases [loc. cit.]. This indicated greatest precision in the vicinity of the L D_{95} level of control.

The organic fungicides gave the steepest dosage response curves and the most effective control, the sulphur compounds were intermediate, while the copper fungicides had flat slopes and were ineffective. The results may preferably be expressed as per cent. dosage to give 95 per cent. control, i.e., the L D_{95}, or as per cent. disease at a spray dosage of 0·2 per cent. In exploratory tests the method of classifying developed for tomato diseases [loc. cit.] may be used.

Absolute comparisons with laboratory slide-germination tests showed that the sulphur fungicides were rated in the same order and with approximately similar L D_{95} values and slopes of dosage-response curves. The organic compounds were rated in the same order, but were rather more effective in the greenhouse and had steeper curves in the laboratory. The copper fungicides also had steeper curves, but were rated as very effective in the laboratory.

CREAGER (D. B.). **Mosaic of the common Coleus.**—*Phytopathology*, xxxv, 4, pp. 223–229, 2 figs., 1945.

Greenhouse and outdoor plantings of 40 varieties of *Coleus blumei* in Illinois have been observed during the last three years to suffer from a mosaic disease causing foliar mottling, splotches, ring spots, oak-leaf patterns, and hieroglyphic markings. Grafting experiments on the Gold Bound variety clearly identified the pathogen as a transmissible virus, 24 out of 28 having been successful in the first and 75 out of 75 in the second series. All attempts at mechanical transmission having failed, it is suggested that insects may act as vectors of the virus in nature.

CREAGER (D. B.). **Rhizoctonia neck rot of Gladiolus.**—*Phytopathology*, xxxv, 4, pp. 230–232, 2 figs., 1945.

A neck rot of *Gladiolus* has been observed for several years past in commercial plantings in Kanakee County, Illinois, destroying the plants in long (up to 6 or 7 ft.), continuous sections of the rows and causing losses estimated mostly at under 25 but sometimes reaching 100 per cent. The Rewi Fallu, Picardy, Giant Nymph, Opalescent, Pearl Harbor, Dr. F. E. Bennett, and Flaming Sword varieties are highly susceptible, but some indication of resistance has been given by Queen of Bremen. The symptoms usually appear early in May, when brown, necrotic lesions are formed on the leaf bases, about 1 in. below soil-level. The succulent, interveinal parenchyma tissues undergo disintegration, which results in the shredding of the leaf bases, and most or all of the aerial system of the plant wilts and ultimately dies. The leaf sheaths and corm scales may be destroyed, and long, narrow, brown lesions, imparting a horizontally striped appearance, develop on the corms at the points of attachment of the infected scales. The organism isolated from fresh lesions is assumed, on the evidence of comparative cultural studies and inoculation experiments on two of the above-mentioned varieties, to be a strain of *Rhizoctonia* [*Corticium*] *solani* similar to the forms infecting potato, poinsettia [*Euphorbia pulcherrima*], and carnation.

MITRA (A. K.). **Melanopsamma ranjanii sp. nov.: a new parasite of Selaginella.**—*J. Indian bot. Soc.*, xxiii, 4, pp. 158–163, 1 pl., 1 fig., 1944.

A full description is given of *Melanopsamma ranjanii* n.sp., a parasite of *Selaginella chrysocaulos* in the Lloyd Botanical Gardens, Darjeeling [*R.A.M.*, xxiii, p. 300].

JONES (F. R.). **Ascochyta meliloti (Trel.) Davis as the conidial stage of Mycosphaerella lethalis Stone.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxv, pp. 137–138, 1943. [Received April, 1945.]

The conidial stage of *Mycosphaerella lethalis*, the agent of black-stem disease of sweet clover (*Melilotus* spp., including *M. dentata*), has hitherto been referred to *Ascochyta lethalis*, but recent information renders this identification untenable. *A. lethalis* is a synonym of *A. caulicola* [*R.A.M.*, xviii, p. 35], which is not the conidial stage of *Mycosphaerella lethalis* but a distinct species without a known ascigerous phase. It is not readily distinguishable from the imperfect stage of *M. lethalis* by the usual mycological characters, but may easily be differentiated on a cultural basis and usually by its pathological effects on the host. An examination of the original collection of *A. meliloti* (Trel.) Davis from the Missouri Botanic Garden corroborated the opinion of J. A. Stevenson that this represents the conidial stage of *M. lethalis*. An emended description of *A. meliloti* is given. The globose pycnidia measure 100 to 150 μ in diameter and the oblong or slightly curved, unequally divided conidia 13 to 20 (mostly 15 to 18) by 5 to 6 μ.

TEAKLE (L. J. H.). **Molybdenum as a fertiliser in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxi, 4, pp. 335–339, 2 figs., 1944.

During 1944, over 30 tests were carried out in different localities in Western Australia on the response of plant growth to soil applications of molybdenum [cf. *R.A.M.*, xxiv, p. 105] as roasted molybdenite. Subterranean clover was used in most cases as the test plant, and ironstone gravelly soils [cf. ibid., xxii, p. 27] were included wherever possible.

Only on one site was any marked response to the molybdenum observed. Here the molybdenum content of the subterranean clover leaves as p.p.m. air-dry material was 0·4 on the treated strips and 0·1 on the untreated, the corresponding figures for the remaining localities ranging from 0·1 to 8·9, and 0·1 to 0·7. These results do not support the view of Stephens and Oertel that 1 p.p.m. is the normal molybdenum content of subterranean clover [ibid., xxii, p. 484], and indicate the need for further research on this point under Western Australian conditions.

JONES (L. T.) & ELLIOTT (H. G.). **Copper deficiency in the Busselton-Augusta district. A review of its history and investigation with special reference to the re-establishment of Subterranean Clover.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxi, 4, pp. 342–357, 5 figs., 1944.

In this review of the early history of copper deficiency in the soils of the Busselton-Augusta area of Western Australia [cf. *R.A.M.*, xxiii, p. 148] the authors show that the use of copper sulphate or its equivalent as other sources of copper-containing material on copper-deficient land, usually at the rate of 10 lb. per acre, has produced the following beneficial results: (1) following re-seeding, it has induced a quick regeneration of subterranean clover on previously 'stalled' areas, (2) it has increased the copper content of the pasture, with resultant improvement in the health of the stock grazing thereon, and (3) it has increased the carrying capacity of the 'stalled' areas. In most cases, one application appeared to be effective for at least four years.

HYDE (E. O. C.). **Ryegrass seed: pre-harvest examination for blind-seed disease and estimation of germination capacity.**—*N.Z. J. Agric.*, lxx, 3, pp. 271–276, 16 figs., 1945.

In this well-illustrated paper, the author, after briefly describing the life-history of the blind-seed fungus [*Phialea temulenta*: *R.A.M.*, xxiv, pp. 151, 234] of rye grass [*Lolium perenne*] in New Zealand, and the detection of the disease in the laboratory, recommends that samples of the crop should be taken and sent to the Seed Testing Station, Palmerston North [cf. ibid., xxii, p. 171], two to three weeks after flowering and again when the seed is mature.

Reports on immature samples give the proportion of seeds infected up to the time of examination, an indication of the stage of development of the seed, and enable recommendations on subsequent sampling to be made. In reports on mature seed, an estimate of the germinating capacity is given. Such estimates are reasonably reliable, provided the cutting proceeds without much delay. The chief value of these reports is that they enable growers to avoid harvesting crops that are almost worthless because of low germination. The information provided enables a grower to estimate the value of his seed crops and adjust his harvesting programme accordingly.

ALLISON (J. L.). **Selenophoma bromigena leaf spot on Bromus inermis.**—*Phytopathology*, xxxv, 4, pp. 233–240, 1 fig., 1945.

The leaf spot of *Bromus inermis*, an important forage and pasture grass in the north-central United States, caused by *Selenophoma bromigena* (syn. *Septoria*

bromigena) [*R.A.M.*, xviii, p. 742; xxi, p. 144] is generally distributed but apparently specific to the one host, artificial inoculation experiments on other grasses, including *B.* spp. and cereals, having given negative results. The symptoms are typical of those associated with the genus on other Gramineae and consist in the formation on the lower leaves, soon after the onset of growth in the spring, of oblong, chlorotic lesions, 8 to 15 mm. in length, which in about a week turn light brown with a dry centre and pale red margin and may coalesce under humid, cool conditions to cover large areas of the surface. The sheath, stem, rachis, panicles, and glumes may also become involved. In severe cases the plants may be stunted or even killed.

No perfect stage of the pathogen has been found, and overwintering is presumed to be effected by means of the pycnidia. Ingress to the leaf is gained directly through the epidermis, chiefly of the upper surface. Resistant individuals of *B. inermis* are common, so that control of the leaf spot by selection and breeding offers hopeful possibilities. Evidence of physiologic specialization was forthcoming.

Monospore isolates of *Selenophoma bromigena* grew best on potato dextrose agar at 20° to 25° C. Occasional cultures produced variants which failed to give rise to pycnidia or conidia and could only be perpetrated by mycelial subtransfers. They remained constant for two years through repeated subcultures. The variants were non-pathogenic.

CHAMBERLAIN (D. W.) & ALLISON (J. L.). **The brown leaf spot on Bromis inermis caused by Pyrenophora bromi.**—*Phytopathology*, xxxv, 4, pp. 241–248, 1945.

The fungus responsible for a brown leaf spot of *Bromus inermis* observed at the Wisconsin Agricultural Experiment Station in 1941 was identified as *Pyrenophora bromi* (*Helminthosporium bromi*) [*R.A.M.*, iii, p. 65]. The symptoms of the disease conform essentially to those originally described by Diedicke from Germany (*Zbl. Bakt.*, Abt. 2, ix, pp. 317–329, 1902; xi, pp. 52–59, 1903) and corroborated by Drechsler. Minute, dark brown, scattered specks appear on the young leaf blades and gradually become encircled by a yellow halo. The lesions expand, especially in a longitudinal direction, and often coalesce to form large, chlorotic areas, this process being followed by generalized yellowing and withering of the foliage. The morphological characters of *P. bromi* likewise agree with the diagnoses of the above-mentioned authorities.

The fungus was shown by host-range studies to be specific to *B. inermis*, inbred lines of which differed in their reactions, some being altogether susceptible and others highly resistant. Overwintering takes place in the perithecial stage and the bulk of the inoculum is provided by ascospores; the few conidia produced are fragile and short-lived. Both spore forms germinated over a temperature range from 4° to 32° C., the optimum for the ascospores being 20° and for the conidia 28°. *P. bromi* is homothallic, the ascigerous stage having been repeatedly produced by the exposure to monoascospore potato dextrose agar cultures to low temperatures (4° to 12°) for three months.

Invasion of the host is effected by direct penetration of the foliar epidermis and the fungus then establishes itself by ramifying in the intercellular tissues. Cool, humid conditions are conducive to the spread of the disease.

AHLGREN (H. L.), SMITH (D. C.), & NIELSEN (E. L.). **Behaviour of various selections of Kentucky Bluegrass, Poa pratensis L., when grown as spaced plants and in mass seedings.**—*J. Amer. Soc. Agron.*, xxxvii, 4, pp. 268–281, 1945.

The principal diseases affecting Kentucky bluegrass (*Poa pratensis*) in investigations covering the period from 1936 at the Wisconsin Agricultural Experiment Station were leaf spot (*Helminthosporium vagans*) [*R.A.M.*, xxii, p. 99], leaf rust (*Puccinia rubigo-vera* and *P. poae-sudeticae*) [ibid., xxii, p. 313], and mildew

(*Erysiphe graminis*), while stripe smut (*Ustilago striiformis*) [ibid., xxiv, p. 277] affected certain selections in 1942 and 1943. The pathogens developed more extensively in space-planted nursery rows than in mass seedings: under the latter conditions there was little or no relation between yields and disease reaction.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lvi, 3, pp. 113–115, 120, 5 figs., 1945.

In this paper a general, purely tentative, account is given of the decline and die-back of deciduous fruit trees that is causing concern to growers in many parts of New South Wales. There are numerous causes of the condition, but the symptoms are often so similar that it is, as a rule, impossible to diagnose any particular case without a detailed knowledge of the orchard and a first-hand examination of the affected trees. Further, the nature and relative importance of some of the causal factors are as yet little understood. Detailed investigations are, however, being made.

General decline, followed by dying-back of the limbs, and accompanied by a characteristic ridge along the main branches of stone fruit trees, with a sour smell of fermenting sugars, is due to the fruit-tree root weevil [*Leptops squalidus*]. Root-rotting fungi, of which *Armillaria* is the most important and widespread, cause a general decline with resultant die-back. Several organisms attack the trunks and limbs and cause cankers, which by girdling the branch produce die-back. These can often be distinguished by the exudation of gum from the cankers of stone fruits, but on pome fruits gum is not produced. The most important of these diseases are gummosis and die-back of cherries [associated with *Pseudomonas mors-prunorum*: *R.A.M.*, xviii, p. 746] and bacterial canker of apricots [ibid., xxi, p. 281] and, possibly, other stone fruits. Several wood-rotting organisms, such as *Schizophyllum*, *Polystictus*, and *Fomes*, are responsible for die-back, entering the trees through wounds or sun-scalded areas of the bark. A substantial proportion of the cases of die-back found appear to be due to nutritional disturbances, while environmental factors, such as waterlogging and sun scald, are also suspected of causing decline. Finally, incompatibility of certain stocks with commercial varieties results in poor growth and death of the tree. This is particularly the case with some plum stocks. When this occurs, there is usually a general decline of the whole tree, and differences in diameter between stock and scion are readily perceptible.

Hilkenbäumer (F.). **Resistenzzüchtung bei Obstunterlagen.** [Breeding for resistance in fruit stocks.]—*Kühn-Arch.*, lx, pp. 455–461, 1944.

In connexion with the German programme of breeding fruit stocks for resistance to frost, insect pests, and pathogenic micro-organisms, mention is made of some important studies, already referred to in this *Review*, on the development of apple varieties resistant to crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*), scab (*Venturia inaequalis*), and powdery mildew (*Podosphaera leucotricha*), and cherries and peaches resistant to gummosis of physiological origin.

Christopher (E. P.) & Pieniazek (S. A.). **Influence of sulphur sprays on the trunk diameter of young Apple trees (second report.)**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 99–100, 1944.

The following were the diameters (in inches) in December, 1943, of young McIntosh apple trees after five years' treatment against scab [*Venturia inaequalis*] by various spraying programmes at the Rhode Island Agricultural Experiment Station [*R.A.M.*, xxi, p. 530]: lime-sulphur (day), 3·21, ditto (night), 3·20, ditto 1 in 100 (day), 3·45, ditto 1 in 50 (two applications), followed by flotation sulphur paste 10 lb. in 100 gals., 3·39, ditto 1 in 50 (two applications), followed by kolofog

6 in 100, 3·37, flotation sulphur paste 10 in 100, 3·51, sulphur dust, 3·50, and control, 3·11, the corresponding figures for Baldwin being 2·82, 2·93, 3·39, 3·24, 3·42, 3·27, 3·48, and 3·27 respectively. It is apparent from these data that, in the case of the scab-susceptible McIntosh, all the treatments except lime-sulphur at the lower strength were significantly better than none, and that the results reflect the damage done by scab, whereas the resistant Baldwin reacted unfavourably to the weak lime-sulphur and did not appreciably benefit from the other treatments. For McIntosh a dust or wettable sulphur is recommended, but Baldwin, which is very susceptible to spray injury, probably needs little fungicidal treatment during the first five years in the orchard.

PIENIAZEK (S. A.) & CHRISTOPHER (E. P.). **The effect of some new spray materials on the rate of apparent photosynthesis of Apple leaves.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 105–106, 1944.

The results of tests at the Rhode Island Agricultural Station in 1943 to determine the effect of fermate (1½ lb. with the same quantity of hydrated lime in 100 gals. water) and Q_1 (lauryl pyridinium chloride) at a strength of 1 in 5,000, applied to Baldwin apple trees against scab [*Venturia inaequalis*], on foliar photosynthesis [cf. *R.A.M.*, xv, p. 726] are summarized and tabulated. The former preparation was applied in five series between 18th May and 17th July and the latter in three between 17th August and 7th September; the computations of carbon dioxide assimilation (in mg. per 100 sq. cm. per hour) were made on leaf pairs from two trees, one sprayed and the other untreated. In the fermate trials, the average assimilation of the treated leaf pair ranged from 6·06 (at 92° F.) to 16·03 (57°) compared with 7·73 (90°) to 17·61 (57°) for the control, the corresponding values in the Q_1 tests being from 9·20 (72°) to 10·70 (77°) and 11·01 (77°) to 13·47 (95°), respectively. It is evident from these results that Q_1 does not reduce the rate of apparent photosynthesis as much as does fermate. Neither material is as injurious as lime-sulphur in its effects on carbon dioxide assimilation even at high temperatures, and under cooler conditions the retardation from this source is inconsiderable.

TESKE (A. H.) & ZIELINSKI (Q.). **The use of fermate for the control of bitter rot and Cedar rust of Apple.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 107–108, 1944.

Of recent years considerable difficulty has been experienced in Virginia in the control of apple bitter rot [*Glomerella cingulata*] and cedar rust [*Gymnosporangium juniperi-virginianae*], and tests were accordingly carried out to determine the value of fermate for this purpose. The trees selected for the bitter-rot trials were Albemarle Pippins which had suffered severely during the past three years. Fermate was applied to one block on 9th and 22nd June, 14th July, and 4th August at the rate of 1½ lb. in 100 gals. water, with the addition on the first occasion of a mixture of bentonite and goulac, which was subsequently replaced by fish oil soap, while Bordeaux mixture (4–8–100) was used on the other. At harvest time, the percentages of diseased fruits on the fermate and Bordeaux-treated trees were 2 and 6·9, respectively, the latter being considered rather heavy for bitter rot.

The varieties used in the cedar-rust experiments comprised the highly susceptible York Imperial and Rome Beauty and the extremely resistant Grimes Golden and Stayman Winesap. Fermate (1½ in 100) plus 1 pint miscible paraffin was applied in the pink, petal-fall, and second and third cover sprays in comparison with a regular schedule consisting of lime-sulphur (8 qts. in 100 gals.) in the pink, wettable sulphur (8 lb. in 100) in the petal-fall and first cover, and 2–4–100 Bordeaux in the second and third cover sprays. The fruit of all four varieties in the fermate-treated block remained healthy, and so did the leaves of the two resistant sorts, while the amount of rust on the susceptible York Imperial and Rome Beauty foliage was negligible. In the block sprayed according to the standard programme,

Rome Beauty and York Imperial developed 6 and 2·5 per cent. fruit infection and the leaves were also severely attacked; the fruits and foliage of Grimes Golden and Stayman Winesap did not contract cedar rust.

HOUGH (L. F.). **A survey of the scab resistance of the foliage on seedlings in selected Apple progenies.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 260–272, 3 figs., 1944.

This is a tabulated account and discussion of observations at the Illinois Agricultural Experiment Station on the scab (*Venturia inaequalis*) resistance of the foliage of hybrid seedlings, orchard varieties, and crab-like forms of apples under conditions of severe natural infection [cf. *R.A.M.*, xviii, p. 399]. Several species of *Malus* [*Pyrus*], notably *M.* [*P.*] *floribunda* and *M.* [*P.*] *atrosanguinea*, appeared to be completely resistant, while Duchess and Jefferis, the most promising parents among the orchard varieties, have already produced a few highly resistant seedlings.

In crosses between orchard varieties, reaction to *V. inaequalis* is evidently determined by several cumulative factors. However, in an F_2 population of 38 trees from an original cross of Rome Beauty × *P. floribunda*, very clear-cut segregation was observed, approximating a 1 : 1 ratio for resistance versus susceptibility. A few of the seedlings from this progeny possess hopeful possibilities as parents by reason of their exceptionally attractive foliar and tree characters.

MITCHELL (A. E.) & CHILDERS (N. F.). **Further studies on effects of mild and caustic sprays on Apple leaves.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 111–115, 1 fig., 1 graph, 1944.

The writers' greenhouse and field tests at the Ohio Agricultural Experiment Station with a brand of mild sulphur known as kolofog, made by the absorption of fused sulphur into bentonite, lend further weight to the observations of other workers as to the relatively uninjurious character of spraying preparations of the former type compared with liquid lime-sulphur. Stayman Winesap, Turley, and McIntosh apple leaves treated with kolofog (6 lb. in 100 gals. for the earlier, and 4 lb. for the later, applications) were markedly larger than those sprayed with lime-sulphur (in fact, they are designated by local growers as 'elephant leaves'), and somewhat exceeded the dimensions of the foliage in the block receiving kolospray, a material differing from kolofog in two respects, viz., (1) only a portion of the active ingredient is bentonite sulphur, and (2) its higher sulphur content (81 per cent.). To cite some figures from the field trials, the area of leaves on ½ in. spurs of Stayman Winesap, Turley, and McIntosh growing in soil treated with kolofog were 88,848, 134,742, and 134,020 sq. cm., respectively, and their dry weights 814·4, 1,330·4, and 1,160·9 gm., respectively, compared with 79,136, 127,937, and 121,300 sq. cm., respectively, and 703·4, 1,264·9, and 1,062·8, respectively, for kolospray and 69,528, 115,789, and 92,377 sq. cm., respectively, and 641·7, 1,090·5, and 817·5 gm., respectively, for lime-sulphur.

FREAR (D. E. H.), MILLER (H. J.), & FAGAN (F. N.). **Comparative spray deposits and scab control from speed sprayer and single-multiple gun sprayer.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 129–133, 1944.

The so-called 'speed sprayer', introduced in recent years as a means of reducing labour costs and expediting the application of orchard plant-protectives [*R.A.M.*, xxii, p. 490; xxiii, p. 444], consists of a series of small, low-pressure nozzles through which the spray material is discharged, a large propeller producing a strong air blast to drive the spray mist against the trees, and a series of vanes serving to direct the driven mist. The new equipment has been widely adopted by Pennsylvania fruit-growers, and in 1943 orchard trials were carried out at the Agricultural Experiment Station on Stayman Winesap and McIntosh apples to compare the

efficiency of its performance with that of the standard high-pressure sprayer. The materials applied between 26th April (delayed dormant) and 24th July (fourth cover) comprised lime-sulphur solution and dry hydrated lime, lead arsenate, nicotine sulphate, and copper sulphate.

The spray deposits produced by the speed sprayer were lower on the tops and higher on the bottoms of the trees than those from the high-pressure apparatus. This relationship was reflected in the enhanced scab [*Venturia inaequalis*] incidence on McIntosh foliage and fruits and smaller quantity of commercial packed fruit from the trees treated with the speed sprayer (63·8 as compared with 74·4 per cent. from the high-pressure rows). The operations were accomplished on an average more than twice as fast with the speed as with the standard sprayer using the same amount of labour, and further studies along similar lines are planned.

PALMITER (D. H.). **Relation of spray materials to russeting of Delicious and Golden Delicious Apples. Preliminary report.**—*Proc. Amer. Soc. hort. Sci.*, xlv, pp. 113–118, 1 graph, 1944.

To determine the part played by spray materials in inducing fruit-russeting, Golden Delicious apple trees in the Red Hook section of the Hudson Valley were sprayed during 1943 at the pink stage, in bloom, at petal-fall, and 10 and 30 days later with a number of different fungicides.

The results of these trials, together with detailed observations in commercial orchards, indicate that part of the severe russet on Golden Delicious apples and nearly all that on Delicious in the Hudson Valley in 1943 resulted from spray injury. On Delicious no russet was found on unsprayed trees at any elevation, though nearly every sprayed orchard showed considerable russet where the sprays were applied under wet conditions. The only exception was an orchard given fermate throughout the season. Golden Delicious often showed a high percentage of slight russet even on unsprayed trees, though where sulphur-lead arsenate was used the injury was increased and was of a more severe type. The use of fermate on this variety did not eliminate russet, but prevented an increase over that on unsprayed trees.

Lead arsenate without any fungicide caused almost as much russeting on Golden Delicious as the combination of wettable sulphur and arsenical, indicating that at least part of the injury is due to the arsenical. The reduced amount of russet and calyx-end injury where fermate was used with the lead arsenate indicates a corrective action by fermate when used as a spray.

The critical period for russet in 1943 was from the pink stage until two or more weeks after petal-fall. As this is also the critical period for disease development in the Hudson Valley, fermate 1 or 1½–100 applied at the pink, bloom, and petal-fall stages and ten days later should provide both disease control and freedom from russeting. The use of S.E.C. with fermate further reduced russeting and imparted an improved lustre to the fruits.

HOWARD (F. L.), LOCKE (S. B.), & KEIL (H. L.). **Synthetic organic fungicides for Apples.**—*Proc. Amer. Soc. hort. Sci.*, xlv, pp. 131–135, 1 fig., 1944.

During the past two seasons members of two new generic groups of cationic organic fungicides, phenyl-mercury (puratized) and pyridine derivatives (isothan Q) [see below, p. 327], have given outstanding control experimentally against apple diseases in Rhode Island. The high fungicidal value of these materials is shown by the fact that whereas 10 lb. wettable (Camden paste) sulphur or 1½ lb. fermate are used per 100 gals. spray, about 20 gm. puratized N 5 D toxicant or 78 gm. isothan Q 15 toxicant gave equal or better control of scab (*Venturia inaequalis*). Though these materials are used on plants at 1 in 20,000 or 1 in 5,000, respectively, they have far higher potential fungicidal values. As determined by laboratory techniques, some

inhibit spore germination in test fungi to the extent of 90 per cent. or over at 1 part per million in water. Several of them have therapeutic value. For example, the McIntosh apple leaves bearing scab were sprayed with isothan 15 (lauryl isoquinolinium bromide) at 1 in 5,000 and puratized N 5 D (phenyl mercuri triethanol ammonium lactate) at 1 in 20,000. The former suppressed sporulation in 77·2 per cent. of the lesions and the latter in 76·9 per cent. In addition to reducing the amount of potential inoculum, such fungicides also reduce the amount of tissue injured on an individual leaf, so permitting a high photosynthetic level for the foliage. Also, in two years' tests, isothan Q 15 and puratized N 5 D did not increase injury when used with or after insecticides; in fact, lead arsenate caused less injury with these materials than when used alone or with some other fungicides.

In tailoring the molecular structure of these new fungicides to meet disease control specifications, attention has been devoted to lowering the interfacial tension of the spray solution itself, so increasing its ability to cover the infection courts and to wet the pathogen. This provision for improved coverage also avoids the drying of arsenicals in heavy splotches of residue.

RICHARDS (B. L.). **Photosynthetic activity affected by fungicides and scab.**—*Fm Res.*, x, 2, pp. 7, 9, 1 fig., 1944.

Experimental evidence obtained by the author under greenhouse conditions in New York showed that scab [*Venturia inaequalis*] infection materially decreased the photosynthesis of apple leaf tissue. Decrease became measurable in eight to ten days, soon after the lesions appeared. By the end of the second week after inoculation the photosynthetic activity of scabbed, living tissue averaged 30 to 40 per cent. of that of healthy tissue, while in the fourth week the figure was 2 or 3 per cent. On the other hand, during the seven weeks after inoculation, the reduction was seldom, if ever, greater than the percentage area of the leaf covered by the scab lesions.

In a further test scabbed and comparable healthy leaf areas were sprayed with 1 to 50 lime-sulphur solution and flotation sulphur paste, 10 lb. per 100 gals. The applications were confined to the upper leaf surface where the lesions were situated, and the experiments were conducted at 75° F. and 50 per cent. R.H. Lime-sulphur on healthy leaves (upper surface only) and flotation sulphur on both healthy and diseased leaves produced no measurable change in photosynthesis during the two days that followed treatment. When, however, diseased leaves, having 17 to 78 per cent. of their area covered by scab lesions, were sprayed with lime-sulphur, their photosynthetic activity was reduced on an average 29 per cent. below that of the two-day period before treatment. These results show that rupture of the leaf cuticle by the fungus seriously increases the susceptibility of apple leaves to spray injury when a caustic material like lime-sulphur is used.

SOUTHWICK (L.) & SHAW (J. K.). **Some results in correcting magnesium deficiency in Apple orchards.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 8–14, 1944.

From this progress report on the results of some treatments designed to rectify or mitigate the effects of magnesium deficiency in Massachusetts apple orchards [*R.A.M.*, xxiii, p. 442] it appears that in 1943 four early-season (13th and 25th May, 4th and 16th June) spray applications of 2 per cent. magnesium sulphate on five-year-old trees of 20 varieties on several East Malling root stocks gave commercial control of foliar scorch. Soil applications in the late summer of 1942 of magnesium sulphate, magnesium oxide, and calcined kieserite, all at the rate of 5 lb. per tree, benefited young mulched trees in the following season, but older bearing ones in a commercial orchard failed to respond to the magnesium sulphate and kieserite treatments; magnesium limestone proved ineffectual alone but contributed to the reduction of foliar scorch in combination with magnesium sulphate (25 : 10). On the basis of the results obtained to date, magnesium spray applications are recom-

mended, as they benefit the trees the current season and, if added to regular sprays, entail practically no expense.

MONTGOMERY (H. B. S.) & MOORE (M. H.). **The control of bacterial canker and leaf-spot in Sweet Cherry.**—*J. Pomol.*, xxi, 1–4, pp. 155–163, 1 pl., 1945.

Four seasons' spray treatment against bacterial canker (*Pseudomonas morsprunorum*) [*R.A.M.*, xviii, p. 461] of the very susceptible Bigarreau de Schrecken sweet cherry variety, severely affected when the treatment was begun, successfully restored the trees to a sound commercial condition. The applications given consisted of Bordeaux mixture (10–15–100) in the second half of October, just before leaf-fall, and another at a concentration of 6–9–100 in April, just before the blossoms opened. Each gave partial control, while the two in sequence almost eliminated infection by the end of the period. Success is not to be looked for after only one season's treatment; both sprays must be used at the correct time over a period of several seasons.

High autumn rainfall appeared to favour canker the following year, and incidence was also affected by rootstock.

KENWORTHY (A. L.). **Injury to Williams Apples resulting from fumigation with methyl bromide.**—*Proc. Amer. Soc. hort. Sci.*, xlv, pp. 141–145, 3 figs., 1944.

In experiments on the effects of methyl bromide fumigation on apples [*R.A.M.*, xxiv, p. 107], the treated Williams showed after nine days 86 and 98 per cent. external and internal injury, respectively, though the unfumigated fruits were uninjured. The surface injury took the form of 'scald', light brown spots $\frac{1}{8}$ to $\frac{3}{4}$ in. in diameter occurring at any point and often coalescing until they covered the entire fruit. The lesions were somewhat depressed, and the brown tissue extended slightly below the skin. The initial internal injury appeared as a brown discoloration of the outer edge of the carpel wall, the entire inner surface of the carpel wall often being brown. In the advanced form of internal injury two types of brown discoloration were observed. The more prevalent developed in the flesh near the outer edge of the carpel wall. The affected area gradually surrounded the core and inner cortex with a clear line of demarcation. Some fruits were completely brown. The less prevalent type developed uniformly from the skin inwards, often invading the entire fruit.

GOODALL (D. W.). **Studies in the diagnosis of mineral deficiency. II. A comparison of the mineral content of scorched and healthy leaves from the same Apple tree. III. The mineral composition of different types of leaf on Apple trees in early summer.**—*J. Pomol.*, xxi, 1–4, pp. 90–102, 103–107, 1945.

Spectrographic analyses of leaves of apple trees with deficiency symptoms showed that scorch symptoms were related to a low concentration of either magnesium or potassium in the foliage. A comparison of 21-year-old Egremont Russet trees with others of the same variety recently top-worked on to Bascombe's Mystery showed that the foliage of the former contained more magnesium but much less potassium than that of the latter, which suggests that the trunk can supply much more potassium than magnesium to the young leaves, relatively to their requirements of the two elements.

In slightly scorched leaves the concentration of mineral elements did not differ significantly from that in healthy leaves, except that magnesium was always lower in scorched than in healthy leaves of trees deficient in magnesium. In badly scorched leaves there was also less manganese than in healthy leaves of the same tree.

Between July and October the calcium content of the leaves increased, while magnesium decreased in trees with magnesium deficiency, but increased in others. The concentration of calcium, iron, magnesium, and sodium was higher in the petiole and midrib than in the lamina, while that of manganese was lower. High

iron or manganese in the petiole, due to uncontrolled factors, was associated with a low content in the lamina, and vice versa.

As regards deficiency diagnosis by plant analysis, severely scorched leaves should be avoided, but slight scorch is no drawback, and may facilitate the diagnosis of magnesium deficiency, sampling for which is best done late in the season. Spur leaves are better than shoot leaves for the diagnosis of potassium deficiency.

In the third contribution of this series spectrographic analysis revealed no evidence for selecting one type of leaf rather than another for diagnosing mineral deficiencies, but the results demonstrated the importance of basing comparisons between trees in this respect only on leaves of the same morphological type.

RHOADS (A. S.). **Virus and virus-like diseases of Sweet Cherry in Utah, and notes on some conditions affecting various fruit crops.**—*Plant Dis. Reptr*, xxix, 1, pp. 6–19, 1945. [Mimeographed.]

Detailed notes are given on virus and virus-like diseases of sweet cherries in Utah, as well as on a number of other conditions affecting fruit locally. In northern Utah sweet cherries are attacked by rusty mottle [*R.A.M.*, xxiii, pp. 391, 392], wilt (perhaps due to the western X virus but not yet diagnosed with certainty), rasp leaf [ibid., xxii, pp. 421, 488], chlorotic spotting, crinkle [ibid., xix, p. 693; xx, p. 6], and deep suture [ibid., xxiii, pp. 391, 392]. Powdery mildew (*Podosphaera oxyacanthae*) occurs on sweet and sour cherries, but does not seem to be important.

In Washington County sweet cherries were affected by an apparently new virus disease [which is unnamed]. The condition starts as a series of one to several or many irregularly rounded, greenish-yellow, chlorotic spots at various points, occasionally marginal, on the leaves. When scattered they generally range from $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. If numerous they may become confluent, involving sometimes the entire leaf. When the spots are large and scattered, a brownish border surrounds each one, while a small, brown, necrotic area generally occurs at the centre. Affected leaves turn yellow and fall prematurely. In some instances (apparently moderately early stages) one side or some limbs on the crown show conspicuous leaf symptoms, while the foliage on the remaining limbs remains healthy. In advanced cases the disease develops uniformly throughout the crown. By the time the symptoms appear on the foliage throughout a large part of the crown there is considerable defoliation and the limbs most severely affected begin to die back from the ends. The disease is ultimately fatal to the tree.

Both crinkle and deep suture were widespread in Washington County. An abnormal type of foliage referred to as 'incised leaf' was occasionally present. It appears to be related to crinkle. Affected leaves are smaller than normal ones and show irregular, often deeply incised lobes along the margin. Sometimes an abnormal forking of the lateral veins is present. 'Lace leaf', presumed to be due to a virus, was noted on one tree.

Other diseases dealt with include chlorosis of woody plants, associated with iron deficiency, a chlorotic leaf spot of Italian prunes, and a virus-like condition of raspberries, in which the leaves become small, yellow, and curved, the fruit aborts and dries up, and the canes gradually die.

WILSON (E. E.) & STOUT (G. L.). **A bud failure disorder in Almond trees.**—*Bull. Dep. Agric. Calif.*, xxxiii, 1, pp. 60–64, 2 figs., 1944.

'Bud failure' of almonds, otherwise known as 'bud shattering', 'crazy top', 'mule tail', or 'witches' broom' has been prevalent for some years in California, especially in the north-central part of the State, affecting chiefly the Nonpareil and Peerless varieties. The outstanding symptom of the disorder is the failure of some or all the buds on a twig to survive and develop into new growth. Shoots arising from the persisting buds on a partially involved twig appear normal during their first season,

but in the following year they also produce many abortive buds. The same process is repeated from year to year. Limbs on the diseased trees tend to be abnormally slender, with long, bare spaces due to the absence of many lateral buds which would ordinarily provide leaves, spurs, or branches. In case of the death of a terminal bud or shoot, limb elongation proceeds from other buds. The shoots produced by the latter, however, sometimes form acute angles with the twigs from which they develop, and repetition of this procedure results in a crooked limb. Blossoms on the affected trees are apparently normal, but owing to their paucity the total nut harvest is much reduced in comparison with that of healthy trees. Spread of the condition from one part of a tree to another has not been observed in the few cases of partial failure so far investigated, while conversely, diseased branches or trees have not been known to recover. No conclusive evidence is forthcoming for the passage of the disease from tree to tree in the orchard. Further grafting experiments are required to determine the possibility of developing a normal new crown by top-working with scions of the same variety. Hitherto no case of an entire tree dying directly from bud failure has been recorded. Inoculation experiments, which have not yet yielded conclusive results, are in progress to test the theory of virus causation of the failure. If bud variation should be responsible, it must be present in more varieties than one.

BAIN (H. F.) & DEMAREE (J. B.). **Red stele root disease of Strawberry caused by Phytophthora fragariae.**—*J. agric. Res.*, lxx, 1, pp. 11–30, 6 figs., 1945.

The root disease of strawberries variously known as red core root, and black, red, or brown stele root disease (*Phytophthora fragariae*) [*R.A.M.*, xxiii, p. 136; xxiv, p. 156] has been intensively studied by the authors in California. The disease has also been found in Arkansas, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Oregon, Pennsylvania, Tennessee, Virginia, Washington, and Wisconsin. The symptoms [which are described] are those of physiological drought and starvation of the aerial parts brought about by the progressive destruction of the root system. Diagnosis of light infection under dry conditions is rather difficult in the absence of the characteristic oospores usually present in the central cylinder. The pathogen is intermediate between most species of *Phytophthora*, which grow readily on a wide variety of media, and those capable of only slow growth on a restricted range. A favourable medium is Lima bean agar, whereas on malt extract agar the fungus made no growth. The low values of 18° to 22° C. for its optimum growth and 25° for a marked decline mark it off from most species. Growth on oatmeal agar at 22° was most vigorous when the value of the P_H was between 6·0 and 7·2. The biciliate, ellipsoidal zoospores, about 10 to 12 μ in diameter, are like others in the genus. The sexual stage has up to now only been definitely observed within the stele of the host and not in cultures. The oospores are large, having a mean maximum diameter of 33·5 μ. If the size of the spore were a diagnostic character, this would show a relation to *P. megasperma*, which has paragynous antheridia, and *P. erythroseptica*, belonging to the amphigynous group. Since the sexual stage is so difficult to observe in the host and is, as yet, unknown elsewhere, it is uncertain which position the antheridium occupies in *P. fragariae*; the fungus differs from *P. megasperma* in its slower rate of growth. Mating different isolates of the fungus gave no evidence of heterothallism, and the unmated strains, when inoculated separately into the roots of growing strawberry plants, invariably produced oospores. Germination of the oospore has not been fully observed. There is no reliable method of germinating these organs; it is difficult, if not impossible, for them to be produced in the absence of the host plant, and the disease has been known to recur in pots that have had diseased plants in them the previous year even when during the summer they have been exposed to 100° F. and so would not contain mycelium. A short test by

the authors has shown that the soil carried the infection for 18 months. In spite of much effort, no suitable treatment of lightly infected plants with fungicides or hot water has been found to give useful results. Inoculation of roots, leaves, and fruits of plants known to be hosts of other *Phytophthora* spp. indicates that *Fragaria* is the only genus susceptible to *P. fragariae*, the following species being highly susceptible: *F. moschata* Duch., *F. virginiania* Duch., *F. vesca* L., and two of three strains of *F. chiloënsis* (L.) Duch. The third strain of the last-mentioned was not infected when tested.

The authors have found the commercial variety Aberdeen highly resistant to direct zoospore inoculation, and also Nos. 127389 and 127392 of the Division of Plant Exploration and Introduction. Test inoculations of susceptible *Fragaria* plants with various non-papillate species of *Phytophthora* were without success. The practicable methods of controlling the disease, therefore, are growing resistant varieties, keeping fields free of strawberries for at least three or four years after the soil has become contaminated, and preventing the introduction of the disease into non-contaminated soil.

BAWDEN (F. C.). & KLECZKOWSKI (A.). **Protein precipitation and virus inactivation by extracts of Strawberry plants.**—*J. Pomol.*, xxi, 1–4, pp. 2–7, 1945.

Extracts from fully developed leaves of Royal Sovereign strawberry plants, some virus-free, and others affected by crinkle, showed no differences in constitution. When mixed with any antisera or rich normal rabbit serum, both caused an immediate bulky precipitate. The extracts did not alter in appearance when boiled and did not contain any appreciable amount of protein.

The boiled extracts gave a strongly positive test for tannin. From analogy with other viruses, strawberry viruses will probably prove to be proteins. The evidence obtained indicated that when strawberry leaves are minced, large quantities of tannin are released, which precipitate the proteins.

When rubbed over the surface of leaves of tobacco and *Nicotiana glutinosa* the extracts caused scorching and effectively prevented infection with tobacco mosaic virus [*R.A.M.*, xxi, p. 49]. The addition of an equal volume of an aqueous extract of Royal Sovereign strawberry leaves completely inactivated or inhibited a 0·005 per cent. solution of the virus and greatly reduced the infectivity of a 0·05 per cent. solution. That this loss of infectivity was probably produced by tannin in the extract was shown by the still greater inactivation produced by the re-dissolved material extracted from the leaf by acetone.

From these and other experiments it is concluded that failure to transmit strawberry viruses mechanically are just as likely to be due to the properties of the host as to those of the viruses. Almost certainly, all attempts to transmit strawberry viruses by inoculation have been made with fluids containing no virus in an infective state. During maceration of the leaves it would appear that the normal protein, and presumably the viruses, are brought into contact with tannin and perhaps other protein precipitants. These are present in such quantities that after precipitating all the strawberry leaf proteins, aqueous extracts of the 'fibre' contain sufficient to precipitate added proteins; they are also efficient inactivators of mechanically transmitted viruses. Strawberry viruses might not prove transmissible by inoculation, even if they could be extracted from infected plants and freed from inactivating substances; but until this question is settled, failure of mechanical transmission can reasonably be regarded as due to host peculiarities.

PARKER (E. R.) & ROUNDS (M. B.). **Avocado tree decline in relation to soil moisture and drainage in certain California soils.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 71–79, 2 figs., 1944.

Investigations during the winter of 1942–3 in the northern part of San Diego

County, California, showed 'decline' of avocado trees [*R.A.M.*, xiv, p. 707; xxiv, p. 275] to be associated with the presence of free water in the soil, the degree of severity of the disorder being further determined by the extent of inundation of the root zones and the duration of the saturated condition. Irrespective of the primary cause of 'decline' in the area under observation, the predisposing factor is evidently the accumulation of free water in the soil, and control measures should therefore be directed towards the avoidance of this process by a rational system of drainage applicable to the environmental features of particular localities.

Symposium on new developments in fungicides.—*Plant Dis. Reptr, Suppl.* 157, pp. 149–166, 1945. [Mimeographed.]

F. L. HOWARD, in a paper on quaternary ammonium derivatives, states that the examination of the structural formulae of organic compounds indicated by laboratory tests to be strongly fungicidal showed this action to be the property of a certain category of nitrogen-containing compounds. Dosage-response tests of the inhibition of fungus spore germination repeatedly demonstrated that nitrogen-containing compounds in which only three valences were attached to radicals or ions were usually of low or no fungicidal potency. On the other hand, when the molecular configuration allows the nitrogen forming the nucleus, or part of it, to exert five of its valence bonds, a fungus-inhibiting material may be expected to result. Compounds of the latter class have been designated quaternary ammonium derivatives, of which there are at present four generic groups, viz., substituted quaternary ammonium salts, exemplified by zephirin (a complex of phenyl lauryl dimethyl ammonium chloride); phenyl mercuri triethanol ammonium salts, typified by puratized N 5 D (phenyl mercuri triethanol ammonium lactate) [*R.A.M.*, xxiv, p. 139]; 6-membered heterocyclic nitrogen ring compounds, represented by isothan Q15 (lauryl isoquinolinium bromide) [loc. cit.]; and combined 6- and 5-membered heterocyclic nitrogen ring compounds, including cationic nicotinium salts.

J. W. HEUBERGER presents an account of dithiocarbamic acid derivatives as fungicides and insecticides.

J. G. HORSFALL outlines some methods of assaying synergism [ibid., xxiii, p. 264] and antagonism, which are 'generic expressions to cover the effects of poisons or other ingredients acting jointly', and gives illustrations from plant pathology of additive and potentiated synergism and subtractive and potentiated antagonism. An example of additive synergism is the use of cottonseed or other oil to improve the tenacity of fixed coppers. A case of subtractive antagonism is provided by the reduction in toxicity of copper or mercury by calcium and magnesium salts. The scope of the discussion of potentiated synergism and antagonism is limited by ignorance of the mechanism of these processes. However, an example of apparent potentiated synergism is afforded by the enhancement of the potency of the toxic metallic oxides by the admixture of sulphur. No clear-cut case of potentiated antagonism can yet be cited from the relevant literature.

TISDALE (W. H.). **Insecticides and fungicides.**—*Canad. Chem. Process Industr.*, xxix, 2, pp. 73–77, 4 figs., 1945.

Some interesting new applications of chemical research to the improvement of insecticides and fungicides are surveyed. Most of these advances have been noticed from time to time in this *Review*, but mention may be made of the function of finely divided earths, ground peat, wood or bark flours, nut-shell flour, and charcoal products in the conditioning of plant-protectives for use as dusts and dispersible powders; the development of high-velocity, low-volume machines enabling dusts to be driven over trees more than 50 ft. high, and of low-velocity, large-volume machines, the so-called 'fishtail dusters', which apply dense fogs of dust,

sufficient to blanket good-sized fruit trees; and the treatment of wide strips of low-growing, closely planted crops with motorized ground machines.

FLECK (E. E.) & HALLER (H. L.). **Compatibility of DDT with insecticides, fungicides, and fertilizers.**—*Industr. Engng. Chem.*, xxxvii, 4, pp. 403–405, 1945.

Commercial lime-sulphur and 2, 3-dichloro-1, 4-naphthoquinone exerted no catalytic action on the widely used insecticide DDT [*R.A.M.*, xxiv, p. 198]. With mixtures of DDT and ferric dimethyl dithiocarbamate 0·05 mole hydrochloric acid was evolved, the corresponding figures for Bordeaux mixture and sulphur being 0·04 and 0·07, respectively.

ROARK (C.). **Incompatibility of insecticides.**—*J. econ. Ent.*, xxxvii, 2, p. 302, 1944.

Previous studies on the 'incompatibility' of insecticides and fungicides are reviewed, with special emphasis on the former. G. P. Gray (*Bett. Fruit*, ix, pp. 9–10, 35–42, 1914) distinguished three types of 'incompatibility', viz., physical, exemplified by water and mineral spray oil, which do not mix or dissolve but remain as two separate layers; chemical, resulting from the mixture of materials with reciprocal chemical reactions; and therapeutic, when two or more substances exerting antagonistic effects on the organism are blended. A study of the several spray-compatibility charts published reveals many differences of opinion, and A. J. Cox (*Spec. Publ. Calif. Dep. Agric.* 184, 1941) proposes the substitution of the terms 'suitable' and 'unsuitable' for 'compatible' and 'incompatible', with specific reference to the pest and host under consideration.

CROSIER (W.). **Materials and methods in controlling seed-contaminated micro-organisms.**—*Proc. Ass. Off. Seed. Anal. N. Amer. 1942*, pp. 104–106, 1943. [Lithoprint. Received June, 1945.]

U.S.R. 601 and 604 [*R.A.M.*, xxii, p. 291] satisfactorily control moulds on seed in the laboratory, but are injurious to some seeds. Bromanil (tetrabromobenzoquinone) is far inferior to spergon (tetrachlorobenzoquinone), the failure of this dust as a fungicide being due to its insolubility in water. Spergon is excellent against damping-off and is easily adapted to clay, celite, talc, gypsum, or flour. Thiosan is an excellent protectant, and may be applied safely to any seed. Du Bay 1228 E [loc. cit.] reduces moulds on large seeds. Ethyl mercury tartrate, 154–6 B, and fermate all appear to possess laboratory usefulness.

WATSON (R. D.). **Ozone as a fungicide.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 396–399, 1943.

In the author's studies on ozone as a fungicide [cf. *R.A.M.*, xxiii, p. 67] this gas inhibited spore germination and caused plasmylosis in spores. At one part per million it did not completely prevent mould growth on the surface of agar in paper-covered plates, but it suppressed all aerial mould growth. The mycelial growth was under the protective surface of a water film on the agar, and with continuous ozone treatment sporulation was prevented. Mycelia and spores treated with ozone collapsed and turned brown, coloured spores becoming bleached. [*Bacterium*] *coli* was much more susceptible to ozone than the fungi tested. The spores of *Macrosporium* [*Stemphylium*] *sarciniforme* were the most, and those of *Penicillium expansum* the least, resistant.

The effect of the hydrogen-ion concentration of the medium on the toxicity of ozone to *Sclerotinia fructicola* spores was studied. The untreated spores germinated well over a P_H range of 4·3 to 7·95. Germination was about 8 per cent. less at P_H 3·75 than at P_H 4·3 to 7·95. In the plates exposed to ozone germination decreased as the hydrogen-ion concentration increased, indicating that increased acidity increased the toxic effects of the ozone. There were small differences in

germination between P_H 7·95 and 6·15 and a rather greater reduction between 6·15 and 4·3. All the spores were killed at 3·75. The relation between the killing power of ozone and P_H is not clear, but the increased toxicity of ozone as the medium becomes acid is an important factor to consider when experimental results are being interpreted. In tests with a combination of oxides of nitrogen and ozone, oxides of nitrogen had no direct effect on ozone toxicity, indicating that ozone was the toxic agent in ozonized air.

PORTER (R. H.). **Testing the quality of seeds for farm and garden.**—*Res. Bull. Iowa agric. Exp. Sta.* 334, 91 pp., 44 figs., 1944.

In this description of methods of seed-testing it is pointed out that it is necessary to examine the sample for the presence of organisms associated with the seed, for seed lots of high purity and germination, if contaminated with pathogens, may be responsible for serious losses in the current and ensuing years. A simple and rapid test is shaking or centrifuging the seeds with sterile water, after which the water is examined for spores. It is possible to measure spore load (e.g., of cereal smuts) by the haemocytometer. If seeds are spread on sterile agar or moist blotters it is usually possible to determine the presence of certain specific organisms. This would be applicable to blight on peas [*Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes*] or wilt-producing organisms on cabbage [including *Fusarium conglutinans*]. Seeds planted in autoclaved soil and maintained under suitable conditions afford evidence on growing of infection, for example, by [*F. bulbigenum* var. *lycopersici*] on tomato. In the case of virus diseases the plant is grown till it shows the presence or absence of the symptoms. A list is given of the organisms and pathogens associated with a large number of cultivated plants.

LOVELOCK (J. E.). **Wax pencils for writing on cold, wet glass-ware.**—*Nature, Lond.*, clv, 3941, p. 581, 1945.

The author shows that an addition of 5 to 10 per cent. of a detergent, preferably cationic, to the wax and pigment mixture of commercial wax pencils, will overcome the difficulty experienced when using such pencils on glass which is cold or covered with a film of moisture. The following formula is one of many whereby wax pencils can be made in the laboratory without special skill: hard paraffin wax (m.p. 65° C.), 100 gm.; beeswax, 20 gm.; vaseline, 20 gm.; C.T.A.B. (cetyl-trimethylammonium bromide) 10 gm.; fat-soluble dyestuff (for example, Sudan III), 0·5 to 1 gm. The mixture is heated and stirred in a water bath until the waxes melt and the dye and detergent dissolve; 20 gm. titanium oxide or other white pigment is then stirred in. The mixture is cast into sticks 6 in. long by $\frac{1}{8}$ in. in diameter, and wrapped in paper.

LEWIS (R. W.) & LUCAS (E. H.). **Apparatus for growing micro-organisms on a flowing medium.**—*Science*, N.S. ci, 2623, pp. 364–365, 1 fig., 1945.

An apparatus for growing micro-organisms on cellulose tubing is described and figured. It consists of 50 ft. of $\frac{1}{4}$ in. cellulose tubing wound in a coil on supports and suspended in a pyrex glass cylinder. The ends of the tubing are attached to glass tubes which pass out through rubber corks in an aluminium cover. This part is covered with a cloth hood, the outlets are wrapped, and sterilized in an autoclave. A 3-gal. bottle of sterile medium is attached by a rubber tube to the cellulose tube inlet and is supported so that the medium flows into the latter. The outside of the tubing is sprayed with a spore suspension by a special atomizer inserted through an opening in the aluminium cover.

Two or three days after inoculation with *Penicillium notatum* the tubing was covered with mycelium. As a rule the medium was changed daily. On the fourth or fifth day the fungus was covered with spores. When growth was established, the medium was allowed to drop from the outlet tube. On the sixth to eighth day

penicillin was detected in the run-off medium. In a few days the penicillin titre equalled or surpassed that of a flask culture. It is considered that this apparatus would become a useful laboratory tool if better cellulose tubing, not liable to develop leaks, can be obtained.

Preservation of fabrics.—*Mon. Sci. News, 1945*, 5, 1945. [Issued by the British Council, 3 Hanover Street, London.]

After giving brief notes on a number of chemicals used to preserve textiles from fungal and bacterial deterioration, the author states that if cellulose is partly acetylated, its natural properties can be left almost unimpaired or even improved, and its life will be indefinitely prolonged, because it becomes immune from attack. Some of the newer synthetic fibres are also highly resistant to microbial action, nylon, for example, being apparently immune.

GREATHOUSE (G. A.) & AMES (L. M.). **Fabric deterioration by thirteen described and three new species of Chaetomium.**—*Mycologia*, xxxvii, 1, pp. 138–155, 7 figs., 1945.

After pointing out that the rapid deterioration of military fabrics in many tropical and subtropical areas has drawn attention to cellulose-decomposing fungi, among them species of *Chaetomium* [*R.A.M.*, xxiii, p. 266], the authors present evidence of the ability of 16 species of this genus to decompose cotton fabric under varied conditions. Arranged in descending order of deteriorating capacity, the species are *C. globosum*, *C. caprinum*, *C. cancroideum*, *C. dolichotrichum* n.sp., *C. funicolum*, *C. elatum*, *C. contortum*, *C. bostrychodes*, *C. cochliodes*, *C. murarum*, *C. ochraceum*, *C. aterrimum*, *C. aureum*, *C. pachypodioides* n.sp., *C. convolutum*, and *C. microcephalum* n.sp.

When the ability of these species to decompose cellulose fabric in the presence of a standard nutrient salt medium in which the nitrogen was obtained from four different sources was studied, it was found that they fell into seven groups based on their ability to utilize the cotton fabric in the presence of different nitrogen sources. Group I included *C. globosum* and *C. caprinum*, very active cellulose-decomposers that produce slightly greater losses in breaking strength on the nitrogen source sodium nitrate, that ranges on the alkaline side of neutrality after utilization of the nitrate radical by the fungus. Group II was represented by *C. cancroideum*, an active cellulose-decomposer apparently most active on the neutral to slightly acid medium, ammonium nitrate. Group III contained *C. dolichotrichum*, *C. funicolum*, *C. elatum*, and *C. contortum*, active cellulose-destroyers thriving especially well on the more acid nitrogen sources, ammonium nitrate, ammonium sulphate, and ammonium dihydrogen phosphate. Group IV was characterized by species active to moderately active in destroying cellulose and with no marked preference for nitrogen sources. Group V was confined in its preference of nitrogen source to ammonium sulphate and ammonium dihydrogen phosphate, on which it produced moderate losses in breaking strength. Group VI, represented by *C. convolutum*, was relatively inactive. Group VII (*C. microcephalum*) seemed to be restricted in its ability to decompose cellulose to the ammonium nitrate medium. The criterion used for physiological differentiation between the species was the percentage loss in breaking strength of the fabric after seven days' incubation of each isolate.

It is concluded that the organism used in testing fabrics for resistance to mildew should be capable of rapid destruction, stable in its cultural and cellulose-destroying characters, of established response to specific factors, i.e., P_H, temperature, fabric preservative, etc., and of known distribution and occurrence in nature. *C. globosum* and several other species of *Chaetomium* meet most of these requirements [cf. ibid., xxiv, p. 159 *et passim*].

DEAN (J. D.), STRICKLAND (W. B.), & BERARD (W. N.). **The soil burial test for rot-proofed Cotton fabrics.**—*Amer. Dyest. Reptr*, xxxiv, 10, pp. 195–201, 4 figs., 2 graphs, 1945.

A preliminary study conducted at the Southern Regional Research Laboratory, New Orleans, on the soil-burial method of testing rot-proofed cotton fabrics has already been reported [*R.A.M.*, xxiv, p. 158]. In the writer's experiments with copper naphthenate-treated osnaburg, a well-protected sample weighing 6 to 8 oz. per sq. yd. was found to withstand three weeks' burial in fresh soil before undergoing significant deterioration, and for a satisfactory determination of resistance it is preferable to extend the trial period until strength loss amounts to roughly 80 per cent. of the original (average of six weeks). The soil-burial method must thus be definitely placed in the long-range category of evaluation tests, and as yet no high degree of scientific exactitude can be claimed for it. From the practical standpoint, however, it has given reasonably dependable results, the available data indicating that treatments consistently showing high resistance numbers in soil-burial tests make the best records in service performance.

Mould-resistant leathers for use in tropical conditions.—Reprinted from *Mon. Dig. Brit. Leath. Mfrs' Res. Ass.*, 5 pp., February, 1945.

In the past the British Leather Manufacturers' Research Association has recommended the use of the following fungicides (in descending order of preference) against moulds on finished leather [*R.A.M.*, xxiii, p. 401]: para-nitrophenol, β-naphthol, cresylic acid (mixed ortho-, meta-, and para-cresols sold commercially as 'anti-gallic'), and sodium tri-chlorphenate (2–4–5 isomer). American and Australian workers have recommended, in addition, salicyl anilide (shirlan), penta-chlorphenol or its sodium salt (santobrite), and para-chlormeta-xylenol. Organic mercurials are effective, but are apt to cause skin irritation, and highly chlorinated organic compounds, such as penta-chlorphenol, would probably behave similarly.

The fungicides put forward by the Association for present consideration are para-nitrophenol, β-naphthol, and anti-gallic. The first-named is the most widely recommended fungicide for leather, while β-naphthol comes next in general usefulness. Anti-gallic is a good fungicide on vegetable-tanned leather. It is rather less efficient than β-naphthol, but being sold in liquid form, is easy to apply in tan liquors. Shirlan was not efficient in laboratory tests on vegetable-tanned leather, but in field tests in West Africa it gave satisfactory results, when used in higher concentration and applied in grease.

If the treatment is applied in the late tan liquors, 1 part by weight of para-nitrophenol in 1,000 parts tan liquor (i.e., 1 lb. per 100 gals.) is sufficient under English climatic conditions to prevent either the liquor or the leather tanned in it from developing mould. If the leather is to be used in the tropics, a higher concentration is desirable. With β-naphthol, 1 part by weight in 500 parts tan liquor is recommended for leather to be used in this country, with higher concentrations for use in the tropics.

The method of drumming-in para-nitrophenol has also been successfully used in practice with vegetable-tanned bellies in this country. The concentrated stock solution in methylated spirit is added to the drum liquor to give approximately 0·1 per cent. by weight of the fungicide on the dry leather; for tropical conditions, double this amount should be used.

If incorporated in grease, more fungicide is required. Recent field tests in the tropics indicate that the amount of para-nitrophenol or β-naphthol so added should give a final concentration of 0·3 per cent. on vegetable-tanned leather. This figure applies to leather where the full load of fungicide is added to the grease. If added partly from an aqueous medium and partly in the grease, 0·2 per cent. on the weight

of the vegetable-tanned leather will suffice. Chrome or semi-chrome leather, where grease application is recommended, should contain 0·12 per cent. fungicide. The paper concludes with notes on special cases and recommended methods.

Testing the tropical mould-proofness of leather.—1 p., pre-print from *Mon. Dig. Brit. Leath. Mfrs' Res. Ass.*, April, 1945.

The testing conditions and standards adopted by the British Leather Manufacturers Research Association are as follows:—

Leather treated against moulds [cf. *R.A.M.*, xxiii, p. 400; xxiv, p. 160] should remain virtually free from attack for four weeks if maintained at approximately 30° C. and 100 per cent. relative humidity. The temperature should not rise above 37° or fall below 25°. The apparatus used is generally kept in the dark. As a rule it is unnecessary to inoculate the test pieces, as mould spores are present in the atmosphere and also in most leathers. Samples showing mould growth on the cut edges and those with only one or two small colonies at the close of the test period may be regarded as satisfactorily proofed.

Two forms of apparatus are used for testing. The first is a stoppered glass jar, at the bottom of which cotton wool is placed, saturated with hot water. A piece of leather measuring about 2 by 4 in. is suspended over the cotton wool and the jar closed, and kept under the temperature conditions described above for a period not exceeding four weeks, the lid being removed from time to time to make necessary observations and replaced as quickly as possible.

The second form of apparatus consists of a box resembling that described in *Mon. Dig.*, p. 61, March, 1945, but without the hand-holes, in which test pieces of leather are placed on shelves. Water is placed in a dish at the bottom. The same temperature conditions are observed, and water is added to replace that lost by evaporation.

Magrou (J.). **Des Orchidées à la Pomme de Terre. Essai sur la symbiose.** [From the Orchidaceae to the Potato. A sketch of symbiosis.]—203 pp., Paris, Gallimard (Collection 'L'Avenir de la Science', No. 18), 1943. Fr. 38. [Review by E. Roubaud in *Bull. Inst. Pasteur*, xlii, 5–6, pp. 129–131, 1944.]

N. Bernard's studies on the function of mycorrhiza in tuberization among the Orchidaceae and wild Solanaceae form the starting-point of this stimulating survey of the progress to date in the investigation of endophytic invasion of the root system of the cultivated potato, which has been carried on by the author and his collaborators in France. The horticultural and agricultural applications of the discovery that asymbiotic tuberization, both in orchids [*R.A.M.*, xxiv, pp. 200,] and potatoes [ibid., xxiv, p. 242], can be effected by adjustment of the osmotic concentration of the medium through the addition of glycerine or sugar, are discussed in relation to potato cultivation. In nature the formation of tubers in cultivated potatoes lacking mycorrhiza is attributed to the action of the osmotic pressure of the medium surrounding the roots. Two methods are recommended for the production of sound tubers free from degeneration—either planting in mountain soils containing mycorrhiza or the judicious combination of asymbiotic and symbiotic cultures.

Brian (P. W.), Hemming (H. G.), & McGowan (J. C.). **Origin of a toxicity to mycorrhiza in Wareham heath soil.**—*Nature, Lond.*, clv, 3943, pp. 637–638, 1945.

The authors, referring to the growth failure of conifers at Wareham, Dorset (attributed by Rayner [*R.A.M.*, xxi, p. 298] and Neilson Jones [ibid., xxiv, p. 111] to a toxicity to the mycorrhizal fungi normally associated with those trees), and to Neilson Jones's suggestion that it may be due to the production of hydrogen sulphide by aerobic sulphate-reducing bacteria, claim on their part to show that

toxicity is due, at least partly, to the production of fungistatic organic substances by certain *Penicillium* spp. characteristic of the Wareham soil.

Organisms such as *Mucor* spp., *Trichoderma viride*, *P. chrysogenum*, and *Fusarium* spp., which are abundant in meadow or arable soils, were found to be virtually absent from Wareham soils. The soil flora was almost restricted to species of *Penicillium*, of which *P. janczewskii* was the most abundant.

Cultures of these moulds were grown on liquid media and assayed periodically for anti-bacterial and fungistatic activity. Isolates of the *P. jenseni* and *P. nigricans-janczewskii* series produced filtrates antibiotic to *Botrytis allii*. Gliotoxin, extracted from *P. jenseni* and *T. viride*, was found to be highly toxic to mycorrhizal fungi: the researches of Newman and Norman [ibid., xxii, p. 371] are cited as evidence that low microbiological activity in surface subsoils is due to the accumulation of antibiotic metabolic products of certain soil organisms. In these circumstances it is considered plausible to attribute the toxicity of Wareham soil to mycorrhizal fungi to gliotoxin and other antibiotic substances produced by the *Penicillium* spp. dominating its mould flora.

CASTELLANOS (A.). **Los tuberculos radiculares del Aliso ('Alnus jorullensis' H.B.K. var. 'spachii' Regel).** [The root tubercles of the Alder (*'Alnus jorullensis'* H.B.K. var. *'spachii'* Regel).]—*Lilloa Rev. Bot. Tucumán*, x, 2, pp. 413–416, 2 figs., 1944. [English summary.]

The tubercles which occur on the roots of alders (*Alnus jorullensis* var. *spachii*) in the mountains of Tucumán and Salta (Orán), Argentina [cf. *R.A.M.*, xxi, p. 35; xxii, p. 265] are said to be analogous to the nodules of the Leguminosae. The secondary rootlets develop protuberances resembling galls or abnormalities of parasitic origin, while roots of varying diameter bear on their exterior coralline, chestnut-coloured excrescences composed of innumerable branches which proliferate successively to terminate in club-shaped tips. Microscopic examination of a longitudinal section of the tubercle reveals the finely granular consistency of the cells.

SANSOME (EVA R.), DEMEREC (M.), & HOLLAENDER (A.). **Quantitative irradiation experiments with Neurospora crassa. I. Experiments with X-rays.**—*Amer. J. Bot.*, xxxii, 4, pp. 218–226, 1 graph, 1945.

Exposure of the microconidia of *Neurospora crassa* to X-radiation produced variants which genetic analysis demonstrated to be mutants. The increase in mutation rate with increase in energy followed a straight-line relationship at low dosages and attained 78·5 per cent. at 126,000 roentgens. Increased intensity led to increase in the mutation rate. Phenotypic normal and mutant cultures often showed partial sterility when crossed with a standard wild type, this character being attributed to chromosomal aberration. Analysis of the sterility and mutation rates at different dosages and intensities indicated that there are two types of mutants, of which one is caused by chromosomal aberration.

HOLLAENDER (A.), SANSOME (EVA R.), ZIMMER (E.), & DEMEREC (M.). **Quantitative irradiation experiments with Neurospora crassa. II. Ultraviolet irradiation.**—*Amer. J. Bot.*, xxxii, 4, pp. 226–235, 9 figs., 1 graph, 1945.

Continuing their investigations [see preceding abstract], the authors exposed the microconidia of *Neurospora crassa* to ultra-violet irradiation. The most effective wave-length in inducing mutations was 2,650. Genetic analysis showed that 24 of 60 mutants were multiple, and the hypothesis that spores differ in their capacity to give a chromosome rather than a chromatid response to ultra-violet radiation was found insufficient to explain the data, though evidence was obtained that both chromatid and chromosome effects occur. Sterility associated with the mutants was much less frequent than with X-ray-induced mutants. It is suggested that the

ultra-violet effects are localized, whereas the X-ray effects are more diversified, including chromosome breaks and rearrangements.

ROACH (W. A.) & ROBERTS (W. O.). **Further work on plant injection for diagnostic and curative purposes.**—*J. Pomol.*, xxi, 1–4, pp. 108–119, 9 figs., 1945.

In this further account of plant injection studies [*R.A.M.*, xxi, p. 459] the authors describe and figure various improvements made in the appliances used for diagnostic and therapeutic purposes. Notes are given on the results obtained both in Britain and South Africa in the use of injection methods with 25 different kinds of plants, including fruit trees and bushes, forage plants, hops, potatoes, tomatoes, tobacco, and others. An improved method of injecting solids into a tree consists of drilling a small hole through the bark, continuing it at a decreased diameter into the wood, inserting by means of a metal tube and plunger chemical tablets into the wood, and sealing them in with a cork disk, over which the bark soon heals. In this way the tree sustains a minimum of damage.

WEISS (F.). **Viruses and virus diseases and similar maladies of Potatoes, Solanum tuberosum.**—*Plant Dis. Reptr, Suppl.* 155, pp. 82–140, 1945. [Mimeographed.]

This third descriptive list of plant viruses compiled under the auspices of the Committee on Virus Classification and Nomenclature of the American Phytopathological Society is on lines similar to the two preceding lists [*R.A.M.*, xxiv, p. 259], and seeks to solve difficulties presented by the diversity of names applied to potato viruses in different countries and by different investigators. The author offers (1) a statement of the cause of each disease as far as available information permits; (2) the designation of a common name under which information pertaining to each disease is filed in the records and indexes of the American Phytopathological Society; and (3) the listing of names believed to be synonymous or equivalent in the United States and in other countries.

VASUDEVA (R. S.) & LAL (T. B.). **Studies on the virus diseases of Potatoes in India, I. Occurrence of Solanum virus 1.**—*Indian J. agric. Sci.*, xiv, 4, pp. 288–295, 2 pl., 1945.

The authors describe and tabulate the properties and effects on differential hosts (White Burley tobacco, *Nicotiana glutinosa*, *N. rustica*, *N. sylvestris*, *Datura stramonium*, *Solanum nodiflorum*, *Capsicum annuum*, and Sutton's Early Market tomato) of a relatively virulent strain of *Solanum* virus 1 [potato virus X], isolated at the Imperial Agricultural Research Institute, New Delhi, from Majestic potatoes originating at Bhowali, United Provinces. The infectivity of the virus is lost at a dilution of 1 in 100,000, and ten minutes' exposure to a temperature of 75° C. suffices to destroy the active principle. The activity of the virus is not impaired by passage through Chamberland filters of grades L_3 and L_5 or by 202 days' storage, and it was still viable, though with diminished virulence, after 234 days. Similarly, drying at room temperature reduced the violence of the virus but did not altogether inactivate it. It succumbed, however, to 12 and 32 hours' exposure to the vapours of absolute alcohol and ether, respectively. On the basis of the symptoms induced on the above-mentioned differential hosts, 12 isolates of potato virus X, including the one under discussion, have been divided into four groups, in which the symptoms produced are (1) generally faint, (2) definite or pronounced, (3) highly pronounced or necrotic, and (4) extremely severe necrosis and even collapse of the leaves, respectively.

BALD (J. G.). **Progress of work with Potato stocks free from virus X (FX Potatoes).**—*J. Coun. sci. industr. Res. Aust.*, xvii, 4, pp. 258–263, 1944.

In 1941 12 clones of Up-to-Date Potatoes free from virus X were divided into seven maturity classes, and after three years the yields roughly confirmed this

classification. From this and other evidence it is clear that there are agronomic differences between the clones of FX Up-to-Date, but it will take years to find the clones most suitable to different regions. It has been found easy to add other clones to these, for when selections are made in the field on a basis of yield, tuber type, and freedom from disease and these selections are multiplied and selected, the most promising tubers from the multiplied stock have been found by inoculation tests to be free from virus X. Two important results have been obtained: first, that FX stocks can be grown on farms for several successive years under commercial conditions without becoming infected; and second, that the actual yields of FX stocks are greater than those from certified seed which is X-infected. The trials show a gain of between 14 and 27 per cent. except in one instance, a trial between FX clones from another district against local infected seed. The amount of FX Up-to-Date seed tubers available for planting next season will probably exceed 50 tons, though much was lost by rot in transit owing to war conditions.

In Tasmania virus A in combination with virus X caused such losses in Silverskin Bismarck that the variety was threatened with virtual extinction. After it had been freed by selection from virus A, two tubers of healthy-looking plants were found to be free from virus X. This Bismarck clone has been multiplied, so that it is hoped there will be sufficient seed for nearly two acres next year, and the appearance of vigour and the yield and quality of the tubers are so good that the Bismarck FX will be included in the scheme.

In Victoria the variety Snowflake is sometimes found to contain a high percentage of diseased and unthrifty plants. Five FX Snowflake have been taken over by the Victoria Department of Agriculture for multiplication. Two promising American varieties are Katahdin and Sebago. Stocks of these received by the Australian Council have been maintained virus-free, but other introductions, especially of the latter variety, have become infected. Certain varieties such as Carman (possibly synonymous with Green Mountain), Brownell, and Delaware have failed in spite of much effort to yield virus-free stocks.

The plan for the distribution of FX stock is not yet fully in operation. Growers will be required to renew their certified FX seed regularly from crops derived from multiplication blocks. These in their turn are obtained from isolation blocks derived from foundation blocks. Of the two varieties so far taken into the FX plan, Bismarck is susceptible to virus A, while Up-to-Date is field-immune. Their reactions towards leaf roll are reversed. Hence, if the isolation crop surrounds the the very valuable foundation crop, the latter is buffered against visits of infective winged aphids from a distance and from aphid-borne infection from the isolation blocks by the differences in susceptibility of the two species. The cost of the foundation and isolation blocks is borne by the Commonwealth Government; they are situated in Tasmania. The tubers are distributed free to the State Departments of Agriculture. Testing for virus X, which at present is performed by inoculation on *Datura stramonium*, is shared by the Tasmanian and Canberra officials.

BALD (J. G.). **Development of differences in yield between FX and virus X-infected Up-to-Date Potatoes.**—*J. Coun. sci. Industr. Res. Aust.*, xvii, 4, pp. 263–273, 1944.

In connexion with yield trials of FX Up-to-Date stocks [see preceding abstract], tests were carried out near Canberra to compare the yield of FX tubers with (1) Tasmanian Up-to-Date, practically uninfected with virus X, (2) certified but X-infected Up-to-Date, and (3) Bismarck (an early variety) certified but X-infected and other varieties. In one test a portion of the crop planted in October, 1943, was lifted when immature, in February, 1944, and another in April. The yield of the tubers lifted at these dates expressed as percentages of the mean yield of FX-Up-to-Date were (1) Tasmanian 99 and 103 per cent., respectively, (2) certified but

infected Up-to-Date, 96 and 83 per cent., respectively, and (3) Bismarck 107 and 63 per cent., respectively. It will be seen that the infected stocks were lower in yield at maturity, but not markedly so when immature. A complication occurs in the case of an early variety as, at a given time, a different leaf area is available for that variety. The leaf areas were measured from time to time, but the yields per leaf area did not point to a different result. A second test using other varieties led to the same result, namely, that the plants from virus X-free tubers produce larger yields than those from infected tubers and that the difference occurs after the completion of growth.

It is at least as probable that this is due to the protein as to the carbohydrate metabolism, for under Australian conditions infection by virus X does not affect outer leaf area up to the time it reaches its maximum or the yield till tuberization is well advanced; thus it does not cause a serious loss in efficiency either of photosynthesis or the translocation of its products. It has, however, been shown to cause reduction in flowering, and flowering makes demands on mobile protein. It is unlikely that flow through the roots is altered by infection, for the ash content of the plant is the same in infected as in non-infected plants. Again, there is an equal percentage of carbon in the dry weight of the tubers, though in old infected plants there is more sugar and starch in the leaves. It is believed that the virus causes the formation of a virus protein instead of the normal chromoprotein (chloroprotein).

FEISTRITZER (W.). **Möglichkeiten einer systematischen Resistenzzüchtung gegen die Abbaukrankheiten der Kartoffel.** [Possibilities of systematic breeding for resistance to degeneration diseases of the Potato.]—*Kühn-Arch.*, lx, pp. 347–357, 2 diags., 1944.

A tabulated survey is given of several years' investigations on the breeding of potatoes for resistance to 'degeneration' diseases (mostly leaf roll and various types of mosaic) in Germany, the outcome of which is discussed in relation to some contemporary studies on the same project. The following are among the conclusions reached. (1) Trial fields must be situated in such a way as to provide all the viruses with equal opportunities of access to the breeding material. (2) In order to counteract the various elements of uncertainty and irregularity inherent in outdoor trials the breeding material should be subjected, at each stage in the process of selection, to several years' tests, preferably with the repeated introduction of standard varieties for comparison. In this connexion a four-year scheme is propounded and explained. (3) The varying grades of resistance in early sorts cannot be correctly appraised in districts where natural infection is so intense as to involve the entire first-year progeny, and material of this kind should be tested in less severely affected localities. (4) The number of highly resistant offspring of a cross depends on the degree of resistance possessed by the parents. (5) From crosses between two highly resistant varieties of *Solanum tuberosum* progeny may arise with a capacity for resistance surpassing that of the progenitors. (6) The combination of 'high resistance × very good quality' is not unrepeatable, but may be developed by rational crossing and selection. The following combinations are recommended as offering particularly attractive possibilities: (*a*) very good quality and high resistance × high resistance plus medium to good quality, e.g., Flava × Böhm's Mittelfrühe; (*b*) very good quality plus high resistance × moderate to medium resistance plus high quality, e.g., Flava × Sieglinde; and (*c*) very good quality plus moderate to medium resistance × high resistance plus fair quality, e.g., Flämingskost × Böhm's Mittelfrühe.

SKAPTASON (J. B.). **Studies of the bacterial ring rot disease of Potatoes.**—*Abstr. Thes. Cornell Univ. 1942*, pp. 383–385, 1943.

Bacterial ring rot of potatoes (*Corynebacterium sepedonicum*) [*R.A.M.*, xxiv,

pp. 5, 116], first recorded in 1906 from Germany, was found in Canada in 1931. In 1932, it was reported from Maine, and by 1940 it was present in 37 States. It was first observed in New York State in 1939.

Preliminary experiments with a medium developed by Burkholder showed that optimum growth occurred at 23° C. in medium buffered to P_H 6·8. Potato extract was found to be essential for growth in culture. The active factor in the potato extract was not replaceable by nicotinic acid, B-alanine, pantothenic acid, pimelic acid, biotin, or thiamin chloride. It was stable to autoclaving, hydrolysable, and precipitated by acetone, alcohol-ether mixture, alcohol, chloroform, barium hydroxide, and phosphotungstic acid. When a potato sample was ashed, it was ascertained that the ash could replace the potato extract in the nutrition of the organism. Finally, the potato ash in the medium was replaced by a mineral element solution containing magnesium sulphate, ferric ammonium sulphate, manganous sulphate, zinc sulphate, and calcium nitrate.

Affected tubers examined under ultra-violet light showed a greenish fluorescence in the vascular area, which was found to be due to the presence of riboflavin. Assays demonstrated that there was at least six times as much of this vitamin in diseased as in healthy tissue. It was also ascertained that the organism synthesizes riboflavin in culture.

From studies on the life-history of the pathogen it was concluded that plant-to-plant spread in the field is not an important mode of dissemination, but that spread occurs almost entirely during seed-cutting and planting. Persistence of the organism in a field through the survival of volunteer plants is not important in the perpetuation of the disease.

NATTRASS (R. M.). **Spraying small areas against Potato blight.**—*E. Afr. agric. J.*, x, 4, p. 238, 1945.

The writer draws attention to the fact that with the aid of an ordinary A.R.P. stirrup-pump an area of 500 to 600 sq. yds. of potatoes can be sprayed against blight [*Phytophthora infestans*], using the standard 18-ft. hose, from one position of the bucket. A better cover is obtained if the plants are sprayed while wet with dew, using a watering-can [*R.A.M.*, xxi, p. 470] or the pump and keeping the nozzle moving rapidly over the crop. The dew serves to spread the fungicide and when dry, the deposit is evenly distributed. As the fungicide becomes diluted by the dew, a stronger solution should be used; with Burgundy mixture a concentration of at least 2 per cent. is advised.

WALLACE (T.). **The diagnosis of mineral deficiencies in plants by visual symptoms. Supplement. A colour atlas and guide.**—48 pp., 95 pl., London, H.M. Stationery Office, 1944. 5*s*.

This supplement [cf. *R.A.M.*, xxii, p. 406] records symptoms of mineral deficiencies in flax, broad bean, pea, red clover, lucerne, lettuce, radish, leek, celery, pear, plum, and sweet cherry, and additional symptoms for other crops. Nitrogen deficiency is depicted for wheat, flax, and vegetable and fruit crops, and recent occurrences of molybdenum deficiency in pasture plants are recorded. An index of crops in the colour plates of both the main edition and the supplement is included.

BLAIR (I. D.). **Techniques for soil fungus studies.**—*N.Z.J. Sci. Tech.*, A, xxvi, 5, pp. 258–271, 9 figs., 4 graphs, 1945.

This is an expanded description of the writer's applications of the Rossi-Cholodny glass-slide technique to the examination of *Rhizoctonia* [*Corticium*] *solani* in unsterilized New Zealand field soil [*R.A.M.*, xxii, p. 449].

ASTHANA (R. P.). & MAHMUD (K. A.). **Bacterial leaf spot of Piper betle.**—*Indian J. agric. Sci.*, xiv, 4, pp. 283–288, 2 figs., 1945.

An account is given of a bacterial leaf spot of *Piper betle* which is responsible for heavy annual losses in the Central Provinces and Berar. The causal organism is quite distinct from those of other bacterial diseases of the same host [*R.A.M.*, xxiv, p. 289] and is referred to *Bacterium betle*, originally described by Ragunathan from Ceylon [ibid., vii, p. 741]. The brown to dark brown, yellow-bordered, circular or angular spots, 1 to 5 mm. in diameter under dry conditions, expand to 1 cm. with the advent of wet weather and frequently coalesce into large patches, the centre of which may crack or fall through. The infected leaves become dull, flaccid, and pale, and are finally shed. A gummy bacterial exudate is deposited on the under side of the leaf. Entry to the foliage is effected through the stomata. The disease is prevalent in heavy soils in low-lying, waterlogged gardens, the Kapuri variety being the most susceptible. Satisfactory control on a financially sound basis may be obtained by irrigation of the gardens a week before planting with 4–4–50 Bordeaux mixture (1 gal. per 12 linear ft.) and spraying the vines with the same compound at 2–2–50 every two months, allowing 1 gal. per 75 ft.

ARRUDA (S. C.) & FRANCO DO AMARAL (J.). **Leaf scald of Sugar Cane in Brazil.**—*Phytopathology*, xxxv, 2, pp. 135–137, 1945.

Microscopic examination, cultural studies, and inoculation tests, the results of which are tabulated, are stated to have confirmed the suspected identity of the agent of a sugar-cane disease in Piracicaba, São Paulo, Brazil, characterized by typical leaf-scald symptoms, with *Phytomonas* (*Xanthomonas*) *albilineans*. The disease has been present in the region under observation for several years and has been under investigation since March, 1943.

DUFRÉNOY (J.). **The occurrence of pyridox (vitamin B6) in Sugar-cane tissues.**—*Proc. La Acad. Sci.*, vii, pp. 13–16, 1942. [Received April, 1945.]

The phenolic substance present in the nodal tissue of certain sugar-cane varieties in Louisiana, e.g., Co. 281, C.P. 28–19, F. 31–962, C.P. 34–21, C.P. 34–54, C.P. 34–79, C.P. 34–84, C.P. 34–86, and C.P. 34–92, is thought to be pyridoxin (vitamin B_6). Margins of red-rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*] lesions in the sites in question gave a much higher pyridoxin reaction than healthy nodal tissues.

CROSS (W. E.). **Informaciones relacionadas con la lucha contra el 'carbón' de la Caña de Azúcar.** [Notifications relating to the campaign against Sugar-Cane 'smut'.]—*Rev. industr. agric. Tucumán*, xxxiv, 4–6, pp. 45–91, 1944.

The information disseminated by the Tucumán (Argentina) Agricultural Experiment Station in its various publications concerning the control of sugar-cane smut [*Ustilago scitaminea*], primarily through the cultivation of immune or resistant varieties [*R.A.M.*, xxiv, p. 73], has been collected and reproduced.

ORJUELA NAVARRETE (J. E.). **Situación patológica de las plantaciones de Caña de Azúcar en las zonas del valle de Cúcuta, Villa del Rosario y regiones aledañas.** [The pathological situation of the Sugar-Cane plantations in the zones of the valley of Cúcuta, Villa del Rosario, and adjoining regions.]—*Rev. Fac. Agron., Medellín*, v, 21, pp. 200–231, 1944.

Previous studies on a destructive root rot of sugar-cane in the Cúcuta Valley, Villa del Rosario, and adjoining regions of Colombia revealed the presence in the plantations of a species of *Rhizoctonia*, though attempts to isolate the fungus were unsuccessful. Material from the Moros district, whence *Thielaviopsis* [*Ceratostomella*] *paradoxa* had already been reported in connexion with the root rot, again

yielded the same fungus in the present investigation. Other organisms associated with the disease included *Diplodia* [*Botryodiplodia*] *theobromae*, *Melanconium* [*Pleocyta*] *sacchari*, *Pythium* spp., *Fusarium* spp., and *Acrostalagmus*.

Contributory factors in the etiology of the root rot are the primitive agricultural methods practised in the affected areas, coupled with excessive irrigation. Nematodes (*Tylenchus* sp.) are another source of injury, some observations on which by F. J. Otoya are included in this paper (pp. 218–223). Control measures should be based, in the first instance, on the rehabilitation of the plantations by appropriate modifications in the present system of cultivation, including the installation of proper drainage. Other necessary reforms include the establishment of a sugar-cane station in Cúcuta to serve as a plant-breeding and seed-certification centre, where 'seed' canes would also be treated, primarily against *C. paradoxa*, by 24 to 36 hours' immersion in a 2 per cent. lime solution, followed by protracted immersion in 4–4–50 Bordeaux mixture.

CHONA (B. L.). **Sugarcane mosaic and its control.**—*Indian Fmg*, v, 4, pp. 178–181, 1944.

Of the four virus diseases of sugar-cane, mosaic, streak, sereh, and Fiji disease, only the first is commonly found in India. Sereh and Fiji disease are absent, and streak has been observed only on two occasions some years ago on Uba cane at Aligarh [United Provinces], and recently on a solitary clump of an indigenous cane at Pusa [cf. *R.A.M.*, vii, 303; x, p. 360].

In experiments in which plots were planted with setts from diseased and healthy plants, it was frequently observed that the plants in the mosaic plots were not all diseased, some of them appearing quite normal. Leaf juice of these healthy canes (Co. 213, 223, 313, 299, and 419) in no case gave rise to mosaic symptoms when inoculated into young cane, maize, and jowar (sorghum) plants.

Both at Pusa and Delhi, it was found that during May and June, artificial transmission was nearly 100 per cent. successful and the incubation period only seven to ten days, hot weather appearing to favour transmission. The evidence obtained indicated that the virus even in the period most unfavourable for artificial transmission is as viable as it is in May and June.

The thermal death point of mosaic juice of different varieties from different localities ranged from 45° to 65° C. Three distinct strains were distinguished, represented by those on Co. 213 (Pusa), Co. 313 (Shahjahanpur), and M16, with thermal death points of 45°, 55°, and 65°, respectively. These differences were not ascribable to the variety, as the Co. 313 (Shahjahanpur) strain after passage through other varieties, including Co. 213 (Pusa) and M16, still had a T.D.P. of 55°. The mosaic strains also showed distinct differences in other physical properties, including dilution end point, longevity *in vitro*, and in permitting recovery from the disease. The virus was not filterable through Chamberland (L3) or Berkfeld (Y) filters. The strains readily cross-infected other varieties and were successfully transmitted to other hosts than sugar-cane, including sorghum, maize, and *Euchlaena mexicana*. P.O.J. 2878 was experimentally infected, and was found to be heavily diseased at Cuttack and Lyallpur. The same virus strain produced widely different patterns on different cane varieties. The virus was not transmissible through the true seed. Maize seed from plants artificially infected with virus from Co. 313 sugar-cane gave mosaic-free plants which remained healthy through three successive generations.

Co. 214 is the only Indian variety of sugar-cane that has not been successfully infected experimentally, neither has it been found naturally infected. Four years' trials showed that much variation in resistance occurs in different varieties; Co. 213, 223, 299, 312, 313, 331, 360, and 419 were highly susceptible.

While losses ascribed to sugar-cane mosaic in different countries range from 5 to

50 per cent. [cf. ibid., xviii, p. 500], careful experiments at Pusa with Co. 213 showed that even a 100 per cent. affected crop suffered only 10 to 12 per cent. reduction in yield of cane, with no loss in extraction or quality of juice. Similar results were obtained with Co. 213 at Patna and Cawnpore. With the thick *ponda* variety Surkha Saharanpuri there was 18 to 20 per cent. loss in cane yield, but no reduction in juice quality.

It may safely be concluded that in India mosaic does little damage to the Co. canes chiefly grown there, which seem highly tolerant. As, however, there are over 4,000,000 acres under sugar-cane in India, the loss from only 10 per cent. infection, involving 1 per cent. reduction in yield, would amount to Rs. 3,300,000 per annum.

Control can be achieved by planting seed from a mosaic-free area, or by careful roguing and selection of local setts.

CHOWDHURY (S.). **Some fungi from Assam. I.**—*Indian J. agric. Sci.*, xix, 3, pp. 230–233, 1944.

This list of fungi collected in Assam includes *Cystopus candidus* on Indian mustard, *Phytophthora colocasiae* on *Colocasia antiquorum*, *Taphrina deformans* on peach, *Tilletia* [*Neovossia*] *horrida* on rice, *Cercospora carthami* on safflower, *C. concors* on potato, and *C. personata* on groundnut.

GREENE (H. C.). **Notes on Wisconsin parasitic fungi. III.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxv, pp. 113–135, 1943. [Received April, 1945.]

This continuation of the author's critical studies on the parasitic fungi of Wisconsin [*R.A.M.*, xxii, p. 409], based mainly on collections made during 1942, contains two new species and two new combinations.

WEST (E.). **Notes on Florida fungi. III.**—*Mycologia*, xxxvii, 1, pp. 65–79, 2 figs., 1945.

This third list of Florida fungi [*R.A.M.*, xx, p. 278] comprises 35 species, including *Gymnosporangium ellisii* on *Myrica cerifera*, *Sirosphaera chlorostoma* on the entomogenous fungi *Verticillium cinnamomeum*, ? *Aschersonia* sp., and *Aegerita webberi*, and *Sirosperma floridana* n.sp. on *Aschersonia* sp.

RHOADS (A. S.). **Further notes on the occurrence of Septobasidium spp. in Florida.**—*Plant Dis. Reptr*, xxix, 8, pp. 215–219, 1945. [Mimeographed.]

These notes provide additional information on the hosts and distribution in Florida of 16 species of *Septobasidium* collected between 1st January and 20th June, 1944.

BOSE (S. R.). **Importance of anatomy in systematics of Polyporaceae.**—*J. Indian bot. Soc.*, xxiii, 4, pp. 153–157, 6 figs., 1944.

The following anatomical characters, in addition to basidia and spore features, have been found helpful in the specific differentiation of Bengal Polyporaceae [*R.A.M.*, xxii, p. 454]: (1*a*) encrusted cystidia, (*b*) simple cystidia, (*c*) encrusted hyphae; (2*a*) setae in the hymenial layer, (*b*) no setae in the hymenial layer, (*c*) setae embedded in the trama, (*d*) presence of curved setae on the upper surface of the pileus; (3) a hyaline, cellular, interrupted layer on the upper surface; (4) resinous palisade-like tissue on the upper surface; (5) no palisade-like tissue on the upper surface, which is non-resinous; (6) indented or lacerated margins of the gills and pore mouths; (7) hyphal 'pegs' inside the pore-tubes which never bear basidia on them; (8) elongated, thick-walled conducting cells in the context and trama; and (9) thick-walled and dead fringe-hyphae covering the hymenium.

MUJICA (F.). **El género Fusarium en Chile. Aporte preliminar a su conocimiento.** [The genus *Fusarium* in Chile. Preliminary contribution to its recognition.]—*Agric. téc. Chile* (formerly *Bol. Sanid. veg., Santiago*), lv, 2, pp. 224–229, 1 fig., 1944. [English summary.]

Following a brief survey of the literature relating to the genus *Fusarium* in Chile, a list is given of five species not hitherto recorded for the country and recently identified by O. Reinking and C. Carrera, namely, *F. culmorum* on vine and maize in the provinces of Santiago and Coquimbo, respectively; *F. semitectum* on a banana imported from Guayaquil, Ecuador; *F. solani* on lemons from the provinces of Nuble and O'Higgins; *F. rubi* on *Fragaria chiloënsis* from Llanquihue; and *F. sambucinum* on potato from Osorno.

TORREY (G. S.). **Two orthographic errors in fungous names.**—*Mycologia*, xxxvii, 1, pp. 160–162, 1945.

With reference to Dr. F. K. Sparrow's paper on *Myrophagus* Thaxter (*Mycologia*, xxxi, pp. 439–444, 1939), the author points out that he made drawings of this organism from specimens shown to him by Thaxter in 1915; the drawings are clearly labelled *Myiophagus*. Sparrow was shown the fungus by Thaxter in 1927, but it appears that Thaxter's specimens and drawings, now at the Farlow Herbarium, bear no name. *Myiophagus* means 'devourer of flies', and *Myrophagus*, apparently, 'ointment-eater.' There can, therefore, be no doubt as to which name was intended by Thaxter, and that used by Sparrow should be corrected to *Myiophagus*, in conformity with Article 70 of the Rules.

LIMBER (D. P.) & CASH (EDITH K.). **Actinopelte dryina.**—*Mycologia*, xxxvii, 1, pp. 129–137, 1945.

Several collections of a fungus associated with leaf spots of oak (*Quercus* spp.), *Liquidambar styraciflua*, and *Eucalyptus* sp. were recently examined by the authors. The fungus appeared to be identical with *Leptothyrium dryinum* Sacc., 1878, renamed *Actinopelte dryina* by von Hoehnel in 1925 with *L. castanicolum* Ell. & Ev., 1888, *A. americana* Hoehn., 1925, restricted by von Hoehnel to American material, and (?) *Leptothyrella liquidambaris* Tehon & Stout, 1929, as synonyms. An emended description is given based on numerous herbarium and recent collections.

BEALE (HELEN P.) & LOJKIN (MARY E.). **Quantitative studies on the precipitin reaction of the Tobacco-mosaic virus-antiserum system.**—*Contr. Boyce Thompson Inst.*, xiii, 8, pp. 385–410, 1 fig., 10 graphs, 1944.

This paper is stated to be the first of a series concerned with the quantitative precipitin reaction of various strains and derivatives of tobacco mosaic virus and their antibodies. After reviewing the development of the serum-precipitin from its use primarily as a qualitative test to an accurate quantitative method, the results of the authors' experiments with the type strain of tobacco mosaic virus are tabulated and discussed. The procedure adopted was based largely upon the methods of Heidelberger and Kendall.

HASLAM (R. J.). **Harrow Resistant Broadleaf Burley.**—*Lighter* (*Dep. Agric. Can.*), xv, 1, p. 14, 1945. [Mimeographed.]

A good selection of the Burley tobacco has been made at the Dominion Experimental Station, Harrow, Ontario, from Johnson's Broadleaf Resistant. The new strain, designated Harrow Resistant Broadleaf, is more resistant to black root rot [*Thielaviopsis basicola*: cf. *R.A.M.*, xviii, p. 824] than its parent, and is finding a ready market.

PRINCE (A. E.). **Initial infections of Tobacco blue mold on old and new beds in South Carolina.**—*Plant Dis. Reptr*, xxix, 10, pp. 270–271, 1945. [Mimeographed.]

From 19th to 23rd March, 1945, the author found the downy mildew fungus (*Peronospora tabacina*) present in 32 old beds in South Carolina and absent from 27. An examination of new beds showed the mildew to be present in five and absent in 77. It was noticed that heavily burned old bed sites had no downy mildew while unburned or lightly burned sites already showed it. Burning was, however, done to control weeds rather than the fungus.

PIZER (N. H.) & DOWNES (W. F.). **Iron deficiency in glass house Tomatoes.**—*J. Minist. Agric.*, lii, 3, pp. 120–126, 1945.

Severe iron deficiency occurred in tomatoes of the Stoner's Exhibition variety grown under glass near Ramsgate in 1944, the plants showing retarded or dwarfed growth, small terminal leaves yellow or white except along the veins, and pale red fruits (pale green or almost white when immature). The soil was overlying chalk and leaf analysis indicated excess lime in the plant probably tending to cause immobilization of iron. Twenty plants, showing slight to severe chlorosis, were top-dressed to a minimum depth of 1½ in. with 8 bush. moist peat containing ½ oz. iron sulphate per bush. Rooting took place nine days later and two waterings with iron sulphate solution (2 oz. to 2 gal.) were then given at intervals of a week. Three weeks after treatment began the plants were recovering. Early diagnosis and treatment is, however, essential, as plants which have suffered badly from chlorosis cannot be brought back into economic cropping.

SELMAN (I. W.). **Virus infection and water loss in Tomato foliage.**—*J. Pomol.*, xxi, 1–4, pp. 146–154, 1 fig., 4 graphs. 1945.

Studies in the transpiration of virus-infected tomato leaves during the incubation period [cf. *R.A.M.*, xx, p. 607] showed that when E.S. 1 tomatoes in pots were inoculated at the 12–13 leaf stage with tobacco-mosaic virus there was an increased rate of water loss, as compared with the controls, from the leaflets on the third day after inoculation. Similar results were obtained with Potentate tomatoes at the 6-leaf stage inoculated with tomato-spotted wilt virus.

From these and other experiments it is concluded that changes in the water relations may, perhaps, be one of the first reactions of living cells to virus proteins, and that the primary effect of the virus appears to be on cuticular transpiration in the tomato, and not upon stomatal behaviour. Inoculation of the upper leaf surface leads to increased transpiration from both upper and lower surfaces, older leaves tending to show a greater increase in the rate of water loss than younger leaves. It is suggested that transpiration methods could be used for the rapid detection of the presence of a virus.

ALTSTATT (G. E.) & IVANOFF (S. S.). **Yellow-top of Tomato.**—*Plant Dis. Reptr*, xxix, 1, pp. 29–30, 1945. [Mimeographed.]

The tomato abnormality referred to as 'yellow top', first reported in southwestern Texas in 1938, and again found in 1941, has occurred every autumn since, and in 1943, one field near Mercedes was 90 per cent. affected. In affected plants, the newest shoots and leaflets are completely without chlorophyll, and are bright yellow or nearly white. The affected shoots generally appear from the upper part of the plant, and are erect. Small, tan-brown, necrotic areas may appear in the chlorotic leaflets. Flower buds are yellow, and many abscise. Discoloured or necrotic areas with an occasional cavity often occur in young branches and stems. The older part of the plant appears to be normal and gives apparently normal fruits. Some old leaves may have bluish veins. Fruits on affected parts often show brown necrotic spots on the scar at the stem end. The flesh is hard, woody, and dis-

coloration is often present within the fruit. A single affected plant may be found between two normal ones in the same row. Apparently, the disease is of a virus nature.

REICHERT (I.), PALTI (J.), & MINZ (G.). **Field trials for the control of Tomato leaf diseases.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 117–141, 1944.

Tomato crops in Palestine suffer from five leaf diseases: powdery mildew (*Leveillula* (*Oidiopsis*) *taurica*) and *Alternaria solani* blight in all parts of the country and at all seasons; leaf mould (*Cladosporium fulvum*) in autumn-grown crops in the coastal plain and in winter and spring crops in the Jordan and Esdraelon Valleys, where the winter crops suffer from *Phytophthora infestans* blight; and leaf spot (*Septoria lycopersici*) [*R.A.M.*, xxiii, p. 319].

In spraying trials carried out from 1939 to 1941, lime-sulphur, cita lime-sulphur, and sulphinette (which increased yields by 53 per cent. in the Jordan Valley) at 1·5 per cent. (but not copper sprays) effectively controlled powdery mildew, and it is concluded that this disease can be controlled in the Jordan Valley by weekly sprayings with lime-sulphur. Leaf mould was controlled by the above-mentioned sulphur preparations and also by sulphocide (sodium pentasulphide) and shirlan AG at 1·5 per cent., Bordeaux mixture (1 per cent.), and perenox (0·33 or 0·5 per cent). The number of fruits injured by frost was markedly reduced by sulphinette, Bordeaux mixture, flordo, perenox (with or without oil), and cuprogreen concentrated (copper oxychloride), the number of injured fruits appearing to bear an inverse relation to the copper content of the spray.

HEINZE (P. H.) & ANDRUS (C. F.). **Apparent localization of Fusarium wilt resistance in the Pan America Tomato.**—*Amer. J. Bot.*, xxxii, 2, pp. 62–66, 4 figs., 1945.

To determine the nature of the resistance to wilt (*Fusarium oxysporum* f. *lycopersici*) [*F. bulbigenum* var. *lycopersici*] of the resistant Pan America tomato variety, approach and splice grafts were made with this variety, with the highly susceptible Bonny Best, and, in one test, with *Lycopersicon pimpinellifolium*, after which the plants were inoculated by Wellman's method by dipping the roots in the inoculum [*R.A.M.*, xix, p. 170; xxiii, p. 121] and planted on a greenhouse bench.

Three experiments were carried out, involving 142 approach grafts of Bonny Best and Pan America. About 40 per cent. of Pan America components showed some symptoms two or three weeks after inoculation. In most cases it was clear that the infection had crossed the graft union from Bonny Best to the Pan America.

Splice grafts were made involving Bonny Best scion on Pan America stock, Pan America scion on Bonny Best stock, Bonny Best scion on Bonny Best stock, and Pan America scion on Pan America stock, the plants being examined for infection 14 days after inoculation. Among the 121 Bonny Best scions on Pan America stocks slight external symptoms were discernible on four. Four other plants had some internal darkening of the vascular tissue, in each case below the graft union. The Pan America scions on Bonny Best stocks showed severe wilt in 118 out of a total of 120 plants. The other two plants showed internal symptoms above and below the graft union. All except one of the Bonny Best scions on Bonny Best stocks developed wilt. Four of the 97 Pan America scions on Pan America stocks showed some wilt. A few susceptible Pan America plants appeared in nearly all these experiments, but they generally represented under 5 per cent. of the total. The Pan America scions on Bonny Best stocks showed more severe symptoms than the Bonny Best scions on Bonny Best stocks. Darkening of the vascular tissue extended well up into the Pan America scion, and the causal organism was found in these scions.

A few Bonny Best scions were grafted on to *L. pimpinellifolium* stocks and the reciprocal grafts made. After inoculation and incubation, ten of the 11 Bonny Best

scions on *L. pimpinellifolium* were free of wilt and all of the 12 *L. pimpinellifolium* scions on Bonny Best showed pronounced wilt.

Splice grafts of Pan America scions on Bonny Best stocks, Bonny Best scions on Bonny Best stocks, and Bonny Best scions on Pan America stocks were made, and the plants inoculated through adventitious roots. Of the 29 Pan America scions on Bonny Best stocks, one showed slight internal symptoms, the remaining 28 being disease-free. Of the 32 Bonny Best scions on Bonny Best stocks, 23 showed definite external symptoms, seven presented internal symptoms, and two appeared to be unaffected. Of the 45 Bonny Best scions on Pan America stocks, 25 showed external symptoms, 12 internal symptoms, and eight appeared to be unaffected.

Cultures made of sterile whole tissues and sterile unheated extracts from the tissues of resistant and susceptible plants failed to show the presence of any substance in the resistant plants toxic to the fungus.

The most important observation made in this work is the complete susceptibility of the Pan America scions when supported on a susceptible Bonny Best root system. Resistance to the wilt fungus in tomatoes appears to be localized completely in the root system of the resistant varieties; apparently, it is not transportable.

COJOCARU (C.). **Comportarea câtorva soiuri de Pătlăgele Roşii faţă de putregaiul inelar al fructelor.** [Reaction of some Tomato varieties to fruit ring rot.]—*Viaţa agric.*, xxxv, 9–10, pp. 159–160, 1944.

Ring rot of tomato fruits (*Phytobacter lycopersicum*) [*Bacterium lycopersicum*: *R.A.M.*, xiii, pp. 194, 288; xvi, p. 302] was prevalent in 1943 at the Agricultural Experiment Station, Cenad, Rumania, where comparative studies on varietal characteristics were in progress. Of the 13 varieties under observation, Imun and Lucullus were the most resistant, with reductions of 0·83 and 1·73 per cent., respectively, of the total product and 1 per cent. in both cases reckoning the fruits separately. The losses in fruit of the varieties Varşovia, Alice Roosevelt, Olandeze, Plovdiv, Ambassador, Budapest, Maginot, Trofei, Triumph, Aurora de Comet, and Ciudorinca amounted to 20, 27, 10, 38, 7, 25, 10, 22, 18, 7 and 23 per cent., respectively.

TYLER (L. J.) & PARKER (K. G.). **Pathogenicity of the Dutch Elm disease fungus.**—*Phytopathology*, xxxv, 4, pp. 257–261, 1945.

Eight culturally distinct races of *Ceratostomella ulmi*, originating as sector variants in mass isolates obtained in 1934 from diseased American elms (*Ulmus americana*) in New York, were inoculated in 1942 into five-year-old trees of the same species, of which 11 were utilized for each of the races A2, A3, A4, B, C, D, and E, while A1 and a mixture of several were applied to 22. Four of the races proved to be actively pathogenic, viz., A1, A2, B, and D, which killed 18 out of 22, 5 out of 11, 6 out of 11, and 9 out of 11 trees, respectively, with corresponding percentages of dead wood of 93, 86·2, 83, and 89·2, respectively. A3, A4, and C caused less severe injury, killing none of the trees and being associated with only 43·6, 22·8, and 34·2 per cent., respectively, of dead wood. The non-sporulating race E was completely non-pathogenic, but the composite inoculum was equally virulent with the four actively deleterious races, killing 14 out of 22 trees and being responsible for 91·2 per cent. of dead wood. The pathogenicity of the several isolates was not appreciably modified by seven years' culture on potato dextrose agar without passage through the elm.

ALBEN (A. O.) & HAMMAR (H. E.). **The effect on Pecan rosette from applications of zinc sulfate, manure, and sulphur on heavy-textured alkaline soils.**—*Proc. Amer. Soc. hort. Sci.*, xlv, pp. 27–32, 1944.

In further work on the control of pecan rosette [*R.A.M.*, xxii, p. 281], an experi-

ment was carried out in the spring of 1941 on Pledger clay soil in Texas, in which the following treatments were applied: manure, sulphur, and zinc sulphate; sulphur and zinc sulphate; manure and sulphur; zinc sulphate; and sulphur. Zinc sulphate was used at 50 and 75 lb. per tree. One cu. yd. sheep manure and 50 lb. sulphur were composted for each of the ten trees used.

The results obtained showed that all the trees that received the zinc sulphate, manure, and sulphur combination had completely recovered by June, 1943. The sulphur and zinc sulphate treatment came next in effectiveness, followed closely by zinc sulphate alone. Sulphur by itself reduced, but did not cure, the condition. The sulphur and manure treatment was no better than the control.

A second experiment was carried out on Catalpa clay soil in 1942 on trees severely rosetted since 1934. For each tree, $\frac{1}{5}$ cu. yd. dairy manure was composted with 50 lb. sulphur, and zinc sulphate at the rates of 50, 85, 100, and 200 lb. per tree was mixed with the compost. To half the trees, the manure, sulphur, and zinc sulphate mixture was applied broadcast and ploughed under, and to the remainder it was applied in holes, 8 in. in diameter, made in the soil at 2-ft. intervals in a circle round the tree 8 ft. from the trunk. After 16 months all the trees given 100 or 200 lb. zinc sulphate with manure and sulphur had recovered except one. Of those given under 100 lb. zinc sulphate, all showed marked improvement. In general, the broadcast application appeared to be rather more effective than the application made in holes.

The Pledger clay had a zinc-fixing power of the 0 to 6 in. horizon of 4,800 lb. zinc per acre, while the corresponding amount for the Catalpa clay was 60,000 lb. It is considered that rosetted pecan trees on almost any soil should respond satisfactorily to the treatment.

DROSDOFF (M.) & KENWORTHY (A. L.). **Magnesium deficiency of Tung trees.**—*Proc. Amer. Soc. hort. Sci.*, xliv, pp. 1–7, 1 fig., 1944.

Tung [*Aleurites fordii*] trees in Florida suffer from a severe marginal leaf scorch associated with magnesium deficiency and characterized by yellow blotches, rapidly developing into brown, necrotic areas, sometimes involving most of the surface, inward curling of the edges, premature defoliation, and eventual stunting. Some alleviation of the symptoms was procured by the incorporation into the soil of nitrogen as a mixture of 1 lb. each of sodium nitrate and ammonium sulphate per tree, and gypsum may also have contributed to an improvement in the health of the trees, but complete recovery was ensured only by soil applications of magnesium sulphate made annually for two years at dosages of 8 and 4 lb. per tree, respectively, for 10- to 12- and 6- to 8-year-old trees. The magnesium content of the foliage from treated trees ranged from 0·20 to 0·35 per cent. compared with 0·05 to 0·16 per cent. in the severely scorched controls.

SMITH (M. E.). **Micronutrients essential for the growth of Pinus radiata.**—*Aust. Forestry*, vii, pp. 22–27, 1943.

At the University of Western Australia, *Pinus radiata* seedlings were grown in Hoagland's culture solution [*R.A.M.*, xiv, p. 376] in two series, one of which was supplied with zinc (0·1 or 0·5 mg. per l.), manganese (0·1 mg.), copper (0·02 mg.), molybdenum (0·01 mg.), and boron (0·1 or 0·5 mg.) [ibid., xx, p. 40], while the same elements were withheld from the other. The symptoms induced by deficiencies of these elements are described in detail.

RHOADS (A. S.). **Witches' broom of Pine trees in Florida.**—*Plant Dis. Reptr*, xxix, 1, pp. 26–28, 1945. [Mimeographed.]

Witches' brooms, of a striking type, and the origin of which has not yet been determined, have been observed recently in Florida on pond pine (*Pinus rigida*

var. *serotina*), sand pine (*P. clausa*), and slash pine (*P. caribaea*). On pond pine the brooms generally occur on the lower or median portion of the crown. In one case, a compact, rounded broom occupying the lower median portion of the crown, was at least 10 ft. in diameter. In such examples the large, compact, rounded mass of limbs composing the broom contrasted markedly with the thin foliage of the tops of the trees. Less conspicuous brooms occurred on other pond pines, radially disposed round the trunk, but occasionally present on the end of a limb. On one pond pine, a great broom with 16 ft. lateral spread started on one side of the trunk at a point $8\frac{1}{2}$ ft. above the ground, and consisted chiefly of long, radiating branches, densely feathered with foliage and showing a dense terminal growth.

On sand pines the brooms were confined mainly to individual branches; only a single branch appeared to be involved, usually high up in the crown. The brooms developed into rounded, compact, densely branched structures generally spherical in outline, but sometimes flattened. They ranged up to 3 ft. in diameter. The limbs showed an abnormally dense growth of branches, with foliage and cones shorter than those on the normal limbs. Giant brooms were found on two fairly young sand pines, and one with a spread of 20 ft. was noted on a slash pine.

The conclusion that the giant brooms, at least, develop at the expense of the balance of the tree is supported by the work of Tubeuf [*R.A.M.*, xii, p. 663.]

Hartley (C.) & May (C.). **Decay of wood in boats.**—12 pp., 1 fig., U.S. Dep. Agric., 1943. [Mimeographed. Received June, 1945.]

This preliminary report on decay of wood in boats is based on surveys made in 1942 by members of the American Division of Forest Pathology of the Bureau of Plant Industry at construction and repair yards. The chief factors responsible appear to be poor material, warm climate, fresh water, leaks, and dead air spaces. Fungi that commonly attack boat timbers include *Poria xantha* on hard and softwoods, *Daedalea quercina* and *Stereum frustulosum* [*S. frustulatum*] on oak, and *Lenzites sepiaria* on softwoods. To reduce decay as much as possible, heartwood of durable species should be used at all critical points of the construction. Wood employed in ship-building should be reasonably seasoned and free from fungal infection before assembly. Water, particularly fresh water, should be kept out and all parts of the hull should be ventilated. If it is necessary to use sapwood and install a tight ceiling, the critical parts of the hull should be constructed of species of wood that take preservative treatment readily. The wood used should be impregnated with a suitable preservative. Where good materials and ventilation are provided, impregnation is not necessary in emergency building, but more superficial treatments should prove useful; in special cases, salt packing may be worth while.

Hansbrough (J. R.), Waterman (Alma M.), & Luxford (R. F.). **The significance of the discolorations in aircraft veneers: Yellow Birch.**—*Mimeo U.S. Dep. Agric.* 1377, 7 pp., 6 figs., 1943. [Received June, 1945.]

Yellow birch (*Betula lutea*) is one of the most important hardwoods used in modern plywood planes, but of the total volume of aircraft-grade yellow birch logs only about 30 to 40 per cent. can be made into veneer of aircraft quality. Of the rejections, 10 per cent. are due to 'dote' [*R.A.M.*, xxii, p. 415] or to discolorations mistaken for it.

The examination of material from 27 mills showed that the forms of discoloration that indicate little or no reduction in toughness comprise light streaks in the heartwood, blue-black metal stains and soot or cinder flecks, yellow to orange chemical stain in the sapwood, pith flecks, and blue stain [loc. cit.] in the sapwood. Discolorations indicating slight to moderate reduction in toughness comprise mineral streaks [loc. cit.] in both sapwood and heartwood, heartwood streaks in the

sapwood, and striped or banded zones in the heartwood. Discolorations indicating excessive reduction in toughness, and rendering yellow birch unacceptable according to official standards in the United States, comprise those forms of decay observed in the present work only in heartwood veneer, and invariably white, cream, yellow, or brown, which produce rough, fibrous, or velvety veneer. Such wood breaks brashly across the grain with little or no splintering, and cracks or splits readily parallel to the grain. In drying, it shrinks and warps, and in advanced stages is perceptibly light and soft. Small, open pockets, zone lines, mottled spots, or black flecks are often associated with decay, but in many cases the wood turns into a uniformly coloured spongy or fibrous mass. The rarely observed brown rot [unspecified] is at first lightly pitted or pocketed and later becomes stringy.

Blue stain occurs infrequently and is limited to the sapwood. It forms light blue streaks running 1 or 2 ft. from the end of logs stored too long during warm weather or shorter stretches centred at worm-holes. When blue stain is present careful inspection for decay is even more necessary.

As a rule, discolorations due to decay produce patterns much less definite in shape and delimitation than do non-injurious discolorations. The former merge gradually into the surrounding clear wood and seldom follow growth-ring patterns. They sometimes resemble mineral streaks but may readily be distinguished from them by the brashness and softness of the wood.

HARTLEY (C.) & SCHEFFER (T. C.). **Recommended practice for controlling sap stain in aircraft Yellow Poplar lumber.**—*Mimeo U.S. Dep. Agric.* 1378, 3 pp., 1 fig., 1943. [Received June, 1945.]

Recommendations are made for the control of sap stain (blue stain) [*R.A.M.*, xxii, p. 415] in yellow poplar [*Liriodendron tulipifera*] lumber used in aeroplane manufacture. To avoid infection the logs should be promptly brought in from the woods and sawn within a few days, if the weather is warm. If prompt sawing is impossible, the logs can be protected for some weeks by treating the ends and barked places within 24 hours of 'bucking' with dowicide H (30 lb. per 100 gals. water), lignasan (8 lb. per 100 gals.), or permatox 10 S (40 lb. per 100 gals.), applied with a garden-sprayer or a brush. When the stain is hard to control, the amount of chemical used may be increased by one-sixth to one-third. The quantities necessary should cost only 5 or 6 cents per 1,000 ft.

To prevent stain in lumber, it should be put into the kiln within 72 hours of leaving the saw. If kiln-drying has to be delayed, the lumber should be dipped within 24 hours of coming from the saw in dowicide H (6 lb. per 100 gals.), permatox 10 S (10 lb.), or lignasan (2 lb., or 1 lb. if 16 to 20 lb. borax are added). Larger amounts may sometimes be necessary. Powdered borax (preferably dissolved in warm water) can be used alone with poplar lumber, a rate of 32 lb. per 100 gals. being recommended. Promptly-dipped lumber can be bulk-piled for two weeks or more while awaiting drying. If the lumber is to be air-seasoned, it should be dipped within 24 hours of sawing, and piled in the open in well-ventilated conditions under a protective roof. If neither kiln-drying nor dipping is possible, the best possible air-seasoning practice should be followed.

The paper concludes with useful notes on dipping technique and on precautions to be observed when using stain-preventive chemicals. The cost of the chemicals required for dipping is about 15 cents per 1,000 board ft. of 4/4 lumber dipped.

Tentative standard instructions for the inspection of preservative treatment of wood.—*Proc. Amer. Wood Pres. Ass.*, xl, pp. 145–153, 1944.

Detailed instructions are given for the inspection of all treatments of forest products under the American Wood Preservers' Association standard specifications.

Tentative standard specification for the preservative treatment of Oak.—*Proc. Amer. Wood Pres. Ass.*, xl, pp. 69–76, 1944.

Tentative specifications which have been laid down for preserving oak sleepers and lumber by pressure processes cover equipment, conditioning, sorting and spacing, machining, oil treatment, manner of treatment by the Lowry, Rueping, Bethell, and Burnett processes, and retention of preservative.

Schmitz (H.), von Schrenk (H.), & Kammerer (A. L.). **II. Decay resistance of Red Oak cross-ties, treated with coal-tar creosote after 34 years' service.**—*Proc. Amer. Wood Pres. Ass.*, xl, pp. 76–106, 5 figs., 1944.

This is the second of a series of studies of the biological environment in treated wood in relation to service life [*R.A.M.*, xxi, p. 108]. It describes an attempt to establish by laboratory tests, under optimum or sub-optimum growing conditions, the relative resistance to *Lenzites trabea* and *Daedalea quercina* of untreated red oak [*Quercus* spp.] and similar sleepers originally treated with coal tar creosote, found free from decay after 34 years' service, and removed from the track only because of mechanical destruction. Examination of test blocks taken from untreated sleepers after twelve months' exposure in a jar on a nutrient malt agar culture inoculated with *L. trabea* and *D. quercina* showed a maximum loss of 55·5 per cent. and an average loss of 37·6.

In the case of the treated sleepers, the authors' conclusions are as follows. Although there were no signs of these sleepers having reached the end of their decay-resistant life when they were withdrawn from service, small test blocks cut from their exterior parts were attacked by the test fungi under laboratory conditions, which are more favourable to the fungi than those on the track. Moreover, in the sleeper as a whole the decay resistance in any part is influenced by the preservative conditions in adjacent parts. Thus, even in a treated sleeper which has withstood the ravages of wood-destroying fungi for 34 years, there are wood areas which, when isolated or changed in position with relation to other areas in the sleeper, may be subject to attack by wood-destroying fungi under certain conditions. Wood in the interior of a treated sleeper may be preserved from attack by fungi even though that same wood—when exposed as a cut—may be susceptible to decay. Treated sleepers should be treated as ecological units when considered as a potential habitat for wood-destroying fungi. When such sleepers are cut in any way the total factors inducing resistance to decay in the original sleeper are altered completely, nor is it possible to reconstruct the total decay resistance of sleepers by piecing together any number of larger or smaller units cut from them.

Rennerfelt (E.). **Blånad och blåytesvampar.** [Blueing and blue-stain fungi.]—*Skogägaren*, xx, 4, pp. 84–88, 91, 4 figs., 1944.

Much of the information contained in this summary of the present position in Sweden regarding the fungal agents of blue stain of wood pulp [including *Phialophora fastigiata*, *Phoma lignicola*, *Pullularia pullulans*, *Trichosporium heteromorphum*, and, under certain conditions, *Ceratostomella piceae*] has already been noticed from other sources [*R.A.M.*, xxi, p. 57 *et passim*], but the following observations may be of interest. Butovitsch and collaborators [no bibliographical reference cited] conducted an experiment in 1938 aiming at the control of the pathogens by storing the pulp in a saturated condition: if not actually submerged in water, the bales should be covered with moss, sod, lichen, cardboard, or some other permeable material. This operation is greatly complicated if performed shortly before the swarming period of the bark beetles [*Scolytus* spp.] concerned in the transmission of the blueing fungi. In this connexion it has been noticed that the discoloration assumed a more severe form when conveyed to the wood by the beetles than in the case of direct infection by wind-borne spores, which do not immediately penetrate

the corticated parts. The application to the wood of an arsenical preparation, effective against the bark beetles, is attended by a serious disadvantage, namely, its stimulatory action on the blueing fungi. The latter are amenable to control by mercury-containing compounds, e.g., fibrosan, lignasan, and pulpasan, which should therefore be used on the end surfaces and other bark-free areas, reserving the arsenicals for the corticated portions.

SNYDER (W. C.) & BAKER (K. F.). **Diseases of seed Cauliflower in California.**—*Plant Dis. Reptr*, xxix, 10, pp. 248–252, 1945. [Mimeographed.]

The authors point out that most of the cauliflower seed used in the United States is supplied by California. Disease surveys made during 1942–44 showed that downy mildew (*Peronospora parasitica*), white blight (*Sclerotinia sclerotiorum*), and mosaic [cauliflower mosaic virus] are the more important diseases present, but do not yet threaten the production or quality of the seed. Powdery mildew (*Erysiphe polygoni*), white rust (*Albugo candida*) [*Cystopus candidus*], *Alternaria* leaf spot (*A. brassicae* and *A.* spp.), ring spot (*Mycosphaerella brassicicola*), and *Phytophthora* root rot (*P. megasperma*) were present in slight or trace amounts, whilst the diseases not found included black rot (*Xanthomonas campestris*), blackleg (*Phoma lingam*), yellows (*Fusarium oxysporum* f. *conglutinans*), club root (*Plasmodiophora brassicae*), and bacterial spot (*Pseudomonas maculicola*). Black rot and black spot not being present, hot-water treatment of the seed is not required, and California meets the demand for seed free from these diseases. Observation shows that California cabbage, broccoli, kohlrabi, and Brussels sprouts seed are also free from them.

HULL (R.) & WATSON (MARION A.). **Virus yellows of Sugar Beet.**—*J. Minist. Agric.*, lii, 2, pp. 66–70, 3 figs., 1945.

In this account of virus yellows of sugar beet and its control [*R.A.M.*, xxiv, p. 260] the authors state that the main factor affecting loss of yield is earliness of infection. A crop with 100 per cent. infection in July loses about 50 per cent. of its potential yield of sugar. If infection occurs later, the losses are correspondingly less; thus, 100 per cent. infection in mid-September reduces the yield by only 15 to 20 per cent.

SNYDER (W. C.) & MIDDLETON (J. T.). **Lima Bean diseases in California.**—*Plant Dis. Reptr*, xxix, 8, p. 206–208, 1945. [Mimeographed.]

The authors give the results of a survey undertaken in 1944 of the diseases of the Lima bean (*Phaseolus lunatus*). The importance of this rather specialized crop is that California supplies the mid-western and eastern States with high-quality Lima bean seed and that western-grown Lima bean seed is reported to carry bacterial blight [*Xanthomonas phaseoli* and other organisms]. The large crop grown for dry beans and seed during normal dry summer seasons was the object of this survey, particularly in the southern coastal counties, where culture of the common Lima for dry beans is rather restricted. The results conform to those obtained in recent years. Foliage and pod diseases were conspicuously absent. Occasional heat blast of the top set of pods, some *Rhizoctonia* infection (*R.* [*Corticium*] *solani*), physiological reddening or burning of foliage, and a trace of powdery mildew [*Erysiphe polygoni*] were the only foliage or pod diseases observed. Soil troubles were more numerous but unimportant. Experience shows that *C. solani*, *Fusarium solani* f. *phaseoli*, and *Pythium ultimum* may cause seedling damage, while later in the season *Macrophomina phaseoli*, nematodes, and insects can give minor trouble. The authors conclude that Californian Lima bean normal summer-grown seeds carry no bacterial pathogens, for no bacterial infection of the plants has anywhere been observed.

McNew (G. L.). **Bean anthracnose may be checked by new spray.**—*Fm Res.*, x, 2, p. 19, 1944.

During the past 20 years, bean anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xxii, p. 50; xxiii, p. 329] has been relatively unimportant in New York, owing to the practice of crop rotation and the use of disease-free seed. In the last two seasons, however, severe local losses have occurred in some important bean-growing areas, such as Madison County.

A test was carried out in which heavily infected seed was planted in rows interspersed between rows of clean seed of the same variety. A plot of eight rows 200 ft. long was divided into four blocks. Two were left unsprayed, and two were treated with fermate (2 lb. per 100 gals.) at intervals of 10 to 14 days, beginning when the first true leaves were fully expanded. Anthracnose appeared about 15th August and spread uniformly throughout the unsprayed plots, though only rare, isolated spots of infection appeared on the sprayed plots. The evidence showed conclusively that the spraying effectively reduced infection and saved about 30 per cent. of the pods. The effect of the fermate on spread was shown by an examination of the plants grown from clean seed. On 14th September, these showed 34·7 and 36 per cent. severe pod infection in the two unsprayed blocks and 0 and 3·2 per cent. in the sprayed.

Smith (H. P.), Altstatt (G. E.), & Byrom (M. H.). **Harvesting and curing of Garlic to prevent decay.**—*Bull. Tex. agric. Exp. Sta.* 651, 28 pp., 10 figs., 1944.

Studies carried out in Texas from 1936 to 1943 on the prevention and control of decay of garlic bulbs [*R.A.M.*, xxii, p. 462] at harvest and in transit showed that the organisms most commonly obtained in culture from decaying garlic included species of *Aspergillus*, *Diplodia*, *Fusarium*, *Helminthosporium*, *Penicillium*, and *Trichoderma*, together with *Sclerotium bataticola* [*Macrophomina phaseoli*] and *S. rolfsii*. Among the bacteria present, the only organism identified was *Bacillus carotovorus* [*Erwinia carotovora*].

Small response in yield resulted on black-land soil near Moulton with 4–12–4, 6–12–6, or 6–18–6 fertilizers applied at 300 to 900 lb. per acre. When sulphur and cuprocide were applied separately in the furrows at 400 and 800, and 200 and 400 lb. per acre, respectively, before dropping in the seed, delayed germination, poorer stands, and lower yields resulted. Pre-planting treatment of garlic clones for seed with nine different chemical disinfectants appeared in most cases to retard and reduce stands, and failed to increase yields. During $3\frac{1}{2}$ months' storage, decay was less when the garlic was cured for 10 to 14 days on wire racks in an open shed or in a barn loft, than when it was cured on the floor of a barn, left in the field, or cured by artificial heat. Drying with hot air (average 120° F.) took 20 to 30 hours, and temperatures over 125° injured the bulbs and increased decay. Bulbs treated with chemical disinfectants and then stored kept no better than the controls.

To secure the largest yields of good-quality garlic, sound, disease-free seed pieces should be planted on low ridges in October and early November, harvested when most of the tops have turned brown, and then cured under shelter on open racks for 10 to 14 days.

Schreiber (F.). **Erfahrungen über Salatzüchtung.** [Observations on Lettuce-breeding.]—*Kühn-Arch.*, lx, pp. 462–465, 1944.

One of the objects of lettuce-breeding for the German market is the development of resistance to downy mildew (*Bremia lactucae*), collar rot (*Sclerotinia sclerotiorum*), and grey mould (*Botrytis cinerea*), and with this end in view crosses have been made of wild forms. Interesting possibilities have already emerged among the fully fertile progeny of *Lactuca sativa* × *L. scariola*, which there is reason to believe represent one and the same species. Segregation in the F_2 resulted in a great variety of forms,

predominantly of the rosette type. Similar experiments are in hand with the wild species *L. saligna*, *L. viminea*, *L. virosa*, and *L. perennis*.

SELMAN (I. W.). **The susceptibility of Lettuce to mosaic virus in relation to nitrogen, phosphate, and water supply.**—*J. Pomol.*, xxi, 1–4, pp. 28–33, 1 pl., 5 graphs, 1945.

When Cheshunt Early Giant lettuces growing under glass in autumn in a mixture of peat and sand with all combinations of three levels of nitrogen, three of phosphate, and two of watering (medium and high) were mechanically inoculated with lettuce mosaic virus [*R.A.M.*, xviii, p. 649], the most susceptible to infection (100 per cent. mosaic) were those given high nitrogen, medium phosphate, and both medium and high water, and the least (12½ per cent. infection) those given low nitrogen, low phosphate, and medium water. A significant nitrogen-water interaction for susceptibility suggested that the available nitrogen content of the soil may be an important factor in determining susceptibility. The mean weights of 87 immature infected lettuces and 144 healthy ones (all treatments) were, respectively, 13·6 and 43·4 gm., a reduction in fresh weight due to infection of 68·7 per cent.

BROOKS (F. T.). **A Pythium rot of Cucumbers.**—*Trans. Brit. mycol. Soc.*, xxvii, 3–4, pp. 134–136, 1945.

Both young and mature fruits of Telegraph cucumber growing in a heated glasshouse with their stems trailing in soil decayed, and when the fruits were placed in a saturated atmosphere they became covered with a profuse white, non-septate mycelium to a depth of 1·5 cm. The odour was somewhat pleasant, not suggesting bacterial decay. The symptoms agreed closely with those described by Drechsler [*R.A.M.*, v, p. 71] for the rot of cucumbers caused by *Pythium aphanidermatum*. Pure cultures were easily obtained and were compared with those of *P. ultimum* from a wilted *Delphinium* and *P. aphanidermatum* supplied by C. J. Hickman [ibid., xxiii, p. 359]. Inoculations of cucumbers through shallow wounds in the surfaces of washed and sterilized mature fruits were performed simultaneously with the three fungi. No differences were observable with regard to the aerial mycelium or the rate of rotting, but on the mycelium of *P. aphanidermatum* there appeared abundant sexual organs and oospores; on *P. ultimum* conidia were formed as well, but the cucumber isolate only showed conidia. Abundant conidia were formed by the last-named on a variety of media, but as with *P. ultimum*, they never gave rise to zoospores. Pathogenicity is identical with that of *P. ultimum*, causing a similar soft rot on potato and carrot tissues. The cucumber fungus is probably a strain of *P. ultimum* which has lost the capacity to produce sexual organs. This belief is strengthened by the investigations of Tompkins *et al.* [ibid., xviii, p. 497], showing that some isolates of a soft rot of pumpkin and watermelon are asexual.

MILLER (J. J.). **Studies on the Fusarium of Muskmelon wilt. I. Pathogenic and cultural studies with particular reference to the cause and nature of variation in the causal organism.**—*Canad. J. Res.*, Sect. C, xxiii, 1, pp. 16–43, 2 pl., 2 figs., 1 graph, 1945.

A serious disease of muskmelons, first reported in Ontario about 1937, causes a wilting of the vines or, when less severe, general unthriftiness and fruit failure, as well as, in strongly infested soil, damping-off and seed decay. From the diseased plants a *Fusarium* has been isolated closely similar to *F. bulbigenum* var. *niveum* f. 2 reported by J. G. Leach and T. M. Currence (*Tech. Bull. Minn. agric. Exp. Sta.* 129, 1938) as causing a wilt of muskmelons in Minnesota. The Minnesota fungus has, however, larger spores but it is thought that these measurements might have been taken from mutants. Isolations from diseased plants in naturally infested soil indicated that the fungus occurs in nature as a form (or forms) producing in culture

abundant aerial mycelium and this is termed the 'wild type'. From this, mutants with less aerial mycelium and darker submerged mycelium are readily produced on all media, and frequently tend to replace the less aggressive parent. The wild type appears to be genetically very stable in its habitat, whereas the mutants tend to disappear in soil infected with both 'wild' and mutant strains. Furthermore, certain of the commoner mutants caused less disease in the field than the 'wild type' and it is considered that variation of the sort observed in culture, if it does occur in the field, is unlikely to be important in the pathology of the disease. The stability of the 'wild type' in sterilized soil and soil agar points to these substrata being of value in maintaining species of *Fusarium* in the pure state. Mutations can be induced by ultra-violet light, though not by heat, and these resemble the natural mutations in appearance and behaviour. The term 'cultural interaction' has been applied to the phenomenon of the invasion of one form by its mutant. It can be clearly seen when the mycelium of the dark mutant invades that of the lighter 'wild type'. It is to some extent specific and may be of taxonomic value. The suggestion is offered that the concept of a 'wild type' may be of wide application in the genus.

MUNGER (H. M.). **Iroquois Muskmelon is resistant to Fusarium wilt.**—*Fm Res.*, x, 2, p. 20, 1 fig., 1944.

The Iroquois muskmelon has been developed to meet the requirements of growers in New York State who have been troubled by *Fusarium* wilt [*F. bulbigenum* var. *niveum* f. 2: *R.A.M.*, xxi, p. 438; xxiv, p. 351]. Iroquois is a selection from a cross between Minnesota Selection 99–36 and Bender. In comparative tests commercial varieties planted as controls never matured a single marketable fruit, whereas Iroquois showed no infection in two years.

WATSON (R. D.). **Sweet Potato soil rot slip treatment and varietal reaction tests in Texas.**—*Plant Dis. Reptr*, xxix, 9, pp. 240–241, 1945. [Mimeographed.]

In a test carried out in Texas on the control of sweet potato soil rot (*Actinomyces ipomoeae*) [*R.A.M.*, xxii, p. 160] by means of chemical treatments, using the Porto Rico variety, the yields obtained were as follows: untreated slips (in each case) 100, semesan bel 115, sulphur dust 93, and fermate dust 108. The percentages of diseased roots were: untreated slips 29·3, semesan bel 35, sulphur 29·2, and fermate 28·8.

Varietal resistance tests showed that B-16 and B-4018 had no infection, L-12, an attractive, yellow-fleshed variety, 3 per cent., Red Velvet 9·5 per cent., and Porto Rico 14·6 per cent. In the case of First Born of Russia and Mameyita, infection reached 28·3 and 31·4 per cent., respectively.

Native Authority Ordinance 1943 (No. 17 of 1943).—The Ibadan Native Authority (Control of Swollen Shoot) Order 1945.—1 p., 1945.

This Order [*R.A.M.*, xxi, p. 544], applicable to the Ibadan Division of Oyo Province, Nigeria, empowers Native Authority or its representative to inspect any cacao farm, and destroy by stumping all cacao trees deemed by the Director of Agriculture or his representatives to be infected with swollen-shoot disease.

Restrictions on the importation of Tomato seed.—*Fmg S. Afr.*, xx, 229, p. 206, 1945.

Owing to the danger of introducing *Aplanobacter* [*Corynebacterium*] *michiganense* [*R.A.M.*, xxiii, p. 80] into South Africa, which is believed to be as yet free from the disease, the importation of tomato seed is prohibited as from 1st September, 1945, except for varieties whose importation is considered desirable by the Division of Horticulture. These will be grown in quarantine under official supervision.

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LEFEBVRE (C. L.) & STEVENSON (J. A.). **The fungus causing zonate leafspot of Cowpea.**—*Mycologia*, xxxvii, 1, pp. 37–45, 2 figs., 1945.

During 1943, cowpeas in the southern States were affected by a disease previously attributed to *Amerosporium oeconomicum* [*R.A.M.*, xxii, p. 127] and designated in this paper zonate leaf spot. The spots are generally more or less circular, but they may coalesce and become irregular. As the fungus develops in a lesion, the tissue becomes brittle and papery, the whole lesion finally dropping out. The pycnidia are generally produced in this white, papery centre, but sometimes they extend beyond it, in the brownish-red tissue forming the outer portion of the spots. They are usually spherical, erumpent, epiphyllous, and range from 155 to 260 (average 208) μ in diameter. The circular ostiole measures 15 to 30 (average 23) μ in diameter, and is surrounded by a ring of more or less upright setae. These are blackish-brown at the base and become lighter towards the tip; they are 0- to 6-septate, straight, and 30 to 170 by 6 to 15 μ. The rather pointed, oblong conidia have 1 to 7 (mostly 3) septa, and measure 16 to 42 by 4 to 6 (average 26 by 4·7) μ; in immature pycnidia many conidia are non-septate.

The fungus is renamed *Aristastoma oeconomicum* (Ellis & Tracy) Tehon, n. comb. (syn. *A. concentrica*) [*R.A.M.*, xii, p. 788]. It occurs in the United States on leaves of cowpea, *Phaseolus* sp., *P. angularis*, *P. max*, *P. radiatus*, and bean (*P. vulgaris*). Reports of the fungus on *Dolichos* spp. and *Vigna catjang* are, properly, on cowpea.

WILLIAMS (W. O.). **Grape-Vine injection apparatus.**—*Science*, N.S., ci, 2625, pp. 416–417, 1 fig., 1945.

The author describes in detail an apparatus for the injection of zinc sulphate solutions into vines affected by zinc deficiency. This method gives much better results than spraying foliage or daubing fresh pruning wounds. The apparatus consists of a soft steel injection point with a radial outlet which is forced into the vine stalk by means of a screw wood clamp. The solution is injected by means of a grease gun attached to the steel point. This pump is calibrated by means of a 250 ml. burette and delivers about 1·66 ml. per stroke. Brass or other non-corrosive metal should be used in the construction of the pump. A dose of 5 ml. 25 per cent. zinc sulphate has given marked improvement in the appearance of zinc-deficient cane-pruned Thompson seedless vines.

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st March, 1944.—16 pp., 1945.

In this report [cf. *R.A.M.*, xxiii, p. 427] it is stated that during the period under review 690 tons of copper sulphate and 1,300 spraying units were issued to banana-growers in the campaign against leaf spot [*Mycosphaerella musicola*: ibid., xxiii, p. 428] in Jamaica.

Pimento disease [rust *Puccinia psidii*: loc. cit.] has restricted the production of this crop to certain defined areas.

Further work was carried out on the development of banana varieties resistant to Panama disease [*Fusarium oxysporum* var. *cubense*: loc. cit.] and leaf spot. In addition, field trials were begun with established varieties immune from Panama disease, though not from leaf spot. It is estimated that even if a satisfactory marketable immune variety is bred immediately, it will be about ten years before any substantial quantity can be produced for export. The chief interest centres round SA 1 [loc. cit.], but no pronouncement as to its potentialities is possible at present.

A study was made of the effect of climatic factors on the viability of the conidia of *M. musicola* produced on banana leaf spots in one locality throughout the year. It was found that the low night temperatures in the cooler months retard conidial development to such an extent that maturity is not fully reached when the dew dries on the leaves in the morning. Spore viability (assessed by recording mortality after the spores had been placed on the surface of a heart leaf and left to germinate for a week) was ascertained to be closely connected with the state of maturity of the conidia. Mortality was highest in the colder months, and the rate of growth of the germ-tubes was slightly retarded by the lower temperatures. These results explain the regular seasonal drop in conidial infection during winter, which does not become apparent until the effect is seen on the comparatively healthy foliage in March or April.

Experimental work, together with a detailed analysis of earlier records, proved conclusively that the rate at which spots appear on a leaf is directly proportional to the intensity of infection per unit area of leaf surface, a heavily infected part of a leaf forming the individual spots much more rapidly than a lightly infected part. In interpreting records of disease intensity at any time of the year, it is essential to take into account the fact that the amount of spotting on any one leaf depends upon the intensity of infection and the age of the leaf, or, conversely, that when the age of a leaf is known, the amount of spotting directly indicates the intensity of infection when the leaf opened. Seasonal fluctuations in disease intensity can therefore be calculated by comparing records of disease either on all the individual leaves of a few plants at any one time of the year, or on leaves of similar age at different times of the year. The extent of latency in spot development depends, apparently, on the amount of toxin secreted by the primary infection hyphae while developing intracellularly after penetration of the stomata; the heavier the infection per unit area of leaf surface, the greater the quantity of toxin released, and the quicker the loss of resistance by the cells of the leaf tissues. Evidence of the existence of a toxin is shown by the yellowing of the tissue round a leaf spot but not round a hole made by mechanical injury.

Spraying trials were carried out on plots of 5 to 25 acres throughout the island to demonstrate the basic principles of control, i.e., (1) the attainment of maximum control in summer, upon which control in winter depends, since three- or four-weekly spraying cycles do not give satisfactory control of ascospore infection, and (2) that the safest time to suspend spraying is in January and February. Records were made of the spotting on individual leaves of parents and followers separately in order to estimate in detail what was the fluctuation of infection. It was found that the plots could be divided into those showing definite evidence of out-of-season tip-spotting (ascospore infection) in August, and those without such spotting. The latter were maintained under excellent control throughout the year, but there was a close correlation between the intensity of tip-spotting in August and the severity of this form of the disease in February, demonstrating clearly that three- to four-weekly spraying cycles do not give satisfactory control of ascospore infection.

Bronze leaf wilt of coco-nuts (loc. cit.) continued to cause considerable losses in the north-western part of the island, but a tendency to spread eastwards was

checked by preventive measures. The decision was taken to treat the disease as if it were infectious: a clearance was made of diseased palms on the north-west coast, first at Trelawny, which is on the edge of the affected area, and then in Hanover and St. James. Over 18,000 palms were felled. Legislation was introduced to enforce the destruction of diseased palms where necessary (Bud Rot and Wilt Disease of Coconuts Order of 30th November, 1943). Burning has not been enforced where the disease was already epidemic and few palms remained, but it is carried out when cases occur in new areas. A general clearance of diseased palms having been effected, fresh cases can be dealt with promptly as they arise.

A mosaic disease-resistance trial with recently imported sugar-cane varieties gave the following results: mosaic-free, B 39184, B 39207, B 39211, B 39213, B 39214, B 39220, B 39223, and B 39257; slightly infected (1 to 3 diseased stools), B 39157, B 39192, B 39215, and B 39222; moderately infected (4 to 6 diseased stools), B 39177 and B 39199; largely infected (7 to 9 diseased stools), B 39198 and B 39200; and very largely infected (11 diseased stools), B 39240.

The following diseases were recorded for the first time in Jamaica: *Cercospora abchazica* causing leaf spot of *Datura suaveolens*, *Alternaria oleracea* causing leaf spot of Chinese cabbage, *C. ricini* causing leaf spot and *Phomposis* sp. leaf blotch of castor oil [*Ricinus communis*], *Helminthosporium sacchari* causing leaf spot of elephant grass (*Pennisetum purpureum*), *Macrosporium parasiticum* [*Pleospora herbarum*] causing onion leaf blight, and *Erwinia carotovora* causing soft rot of the same host. A fungus causing fruit rot of loofahs [*Luffa* sp.], formerly listed as *Macrophoma* sp., was identified as *Botryodiplodia theobromae*.

Fifty-fifth and fifty-sixth Annual Reports of the Texas Agricultural Experiment Station, 1942–3.—45 pp. [? 1944. Received May, 1945.]

This report [cf. *R.A.M.*, xxii, p. 53] contains, *inter alia*, the following items of interest. E. S. McFadden and P. B. Dunkle found that the Rio and Viking flax varieties were highly resistant to rust [*Melampsora lini*: ibid., xxiii, pp. 342, 437]; Norsk and a variety from Turkey, C.K. 862, also proved resistant.

P. R. Johnson has made selections from Blackeye cowpeas resistant to nematodes [*Heterodera marioni*] and *Fusarium* wilt [*F. bulbigenum* var. *tracheiphilum*: ibid., xiv, p. 208]. These selections are almost identical with Blackeye in other respects.

E. S. McFadden, P. B. Dunkle, J. R. Quinby, I. M. Atkins, and H. O. Hill state that a soft red winter wheat, Austin, resistant to stem rust [*Puccinia graminis*] and leaf rust [*P. triticina*], was released to commercial growers in 1942. Two new varieties of hard red winter wheat, Comanche [ibid., xxiii, p. 292] and Wichita, are being distributed. The former, a cross between Tenmarq and Oro, is resistant to bunt [*Tilletia caries* and *T. foetida*], and is superior to Tenmarq in yield, test weight of grain, and resistance to leaf rust. Wichita is a selection from a cross between Early Blackhull and Tenmarq, and in its milling and baking qualities is greatly superior to Blackhull.

P. A. Young states that in tests with Purplehull, which developed 55 per cent. ashy stem blight (*Sclerotium bataticola*) [*Macrophomina phaseoli*], only 6 per cent. of Blackeye [cow]pea No. 8152 become infected. L. M. Blank found that, in three years' tests, early-maturing cotton varieties outyielded late ones by a very significant margin, though the amount of root rot (*Phymatotrichum omnivorum*) in the two groups did not differ significantly. A high-nitrogen fertilizer reduced root rot and increased yields by a highly significant margin. A high-phosphate fertilizer had almost no effect on root rot or increased it, though in the latter case the yield was increased.

F. M. Eaton and N. E. Rigler found that while maize is normally immune from *P. omnivorum* it is rapidly killed by the fungus when grown without its

normal complement of root-surface bacteria on sterilized sand-bentonite substrates. Heavily fruited cotton plants were more susceptible to *P. omnivorum* than were plants from which the bolls had been removed. Boll removal resulted in increased sugar concentrations in the roots and, in turn, in marked changes in the numbers of bacteria supported on the root surfaces. The acidity of certain Texas soils encourages the growth of micro-organisms destructive to the fungus. It grows poorly on acid Wilson soil as found in the field, but makes rapid growth following the addition of calcium carbonate (to neutralize acidity and so alter the microflora), or after steam sterilization, which destroys other organisms. Earlier workers have ascertained that the addition of manures and crop residues to soils encourages antibiotic organisms and reduces root rot [ibid., xxi, p. 137].

G. Ken Knight, A. L. Harrison, and A. A. Dunlap found that three applications of dusting sulphur increased the yield of 'hay' and groundnuts in one trial where *Cercospora* leaf spot [*C. personata* and *C. arachidicola*: ibid., xxii, p. 89; xxiii, p. 6] was severe in 1942. In one test, sulphur-copper dust was slightly more effective than sulphur used alone. Two applications of sulphur controlled rust (*Puccinia arachidis*) [ibid., xxi, p. 362]. In varietal tests marked differences in susceptibility to southern blight (*S. rolfsii*) [ibid., xxi, p. 361] were observed.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1943–44*, Part I, pp. 148–175, 19 figs., 1944.

This report [cf. *R.A.M.*, xxiii, p. 330] contains the following items of interest. As a result of breeding work by I. E. Melhus, C. S. Reddy, and C. Emans for resistance to melon wilt [*Fusarium bulbigenum* var. *niveum*] and anthracnose [*Colletotrichum lagenarium*] seed is to be produced from two new disease-resistant early strains, Early Resistant Queen and Black Kleckley, and from two hybrids, a Dixie Hybrid and a Kleckley Hybrid, the former moderately and the latter very resistant to wilt and anthracnose.

H. C. Murphy states that crown rust [*Puccinia coronata*] seems to have been the most important disease of oats in the humid area of the Upper Mississippi Valley in recent years. Next in importance was *Pythium* root necrosis [*P. debaryanum*: ibid., xxii, p. 383]. In areas of limited rainfall, loose and covered smuts [*Ustilago avenae* and *U. kolleri*, respectively] were more important than crown rust. During the period 1935 to 1943, all oat diseases caused an estimated reduction in yield in Iowa of 26·7 per cent. or an average loss of 13 bush. per acre.

Races 8 and 10 of stem rust [*Puccinia graminis avenae*] showed a phenomenal increase in distribution and prevalence in the Upper Mississippi Valley in 1943. The recently distributed varieties Boone, Control, Marion, Vicland, Tama, Vikota, and Cedar are susceptible to these two races.

Among 245 isolates from oat crown rust collections from the United States and Bermuda in 1943, 32 physiologic races were identified, 11 of which had not previously been recorded. Races 1 and 6 were again the most widespread and prevalent, and together made up over 50 per cent. of all the isolates. Relatively weak races, such as 2, 3, and 29, were again predominant in the New England area. The races present in Bermuda were very similar to those in the United States. In all, 82 physiologic races of crown rust have now been identified, using the 13 standard differential oat varieties. Either Bond or Victoria is resistant to each of the 82 races, or both are, with the exception of race 55 which has not been isolated from collections in North America.

Investigations were made by I. E. Melhus, J. N. Martin, and H. C. Murphy on the effect of seed treatment on soy-beans and the organisms causing root decay. The results of seed-treatment tests showed that stand was increased by some materials, though yield was not. *Pythium debaryanum*, *Rhizoctonia* sp., and *Fusarium* spp. were the organisms most frequently obtained from the roots. The

anthracnose organism (*Colletotrichum glycines*) and the pod and stem blight organism (*Diaporthe sojae*) were commonly obtained from rotting seed, though *Pythium* spp. and a soft rot bacterium were also isolated. *C. glycines* often caused severe neck rot at emergence.

A seed-treatment test for the control of the damping-off stage of potato black scurf (*Rhizoctonia* [*Corticium*] *solani*) by C. S. REDDY, E. L. WALDEE, I. E. MELHUS, and R. H. PORTER showed that fermate (1-minute dip at 1 in 60), an organic mercurial (1-minute dip), and formaldehyde (cold, 2 hours) when used on certified Irish Cobbler seed reduced sprout lesions below the figure for the controls and for thiosan treatment. The number of healthy sprouts per tuber was greatest in the fermate, formaldehyde, and organic-mercurial series, while the best yields were given by formaldehyde and fermate.

The blight [*Phytophthora infestans*] resistance of 42 potato varieties and seedlings was compared by field observations, greenhouse tests of foliage inoculations, and laboratory tests using tuber inoculations. In the field, there were three groups of selections showing reduced susceptibility. The most resistant consisted of the *Solanum demissum* and *S. tuberosum* crosses TI–5 and AOB/4 and U.S.D.A. seedlings 528–229 and 627–216. Arnica was rather less resistant. The third group, which showed only slightly less infection than Irish Cobbler, etc., consisted of U.S.D.A. seedlings 528–170, 528–242, and 574–14, Hindenburg, and Sequoia.

In studies of the control of potato scab [*Actinomyces scabies*] in highly calcareous peat and muck soils by G. C. KENT, I. E. MELHUS, W. J. HOOKER, and A. T. ERWIN, the use of sulphur as a soil amendment at the rate of 2,000 lb. per acre significantly lowered the incidence of the disease. The yield, however, was not significantly higher than those of the untreated controls. Tests of the effects of time and depth of ploughing on scab incidence showed that 'listing' to allow planting on undisturbed peat within the ploughed areas slightly reduced scab, as compared with the regularly planted area. Spring ploughing 10 in. deep definitely reduced incidence below that in the autumn-ploughed areas, whether ploughed 6 or 10 in. deep. The unploughed areas were intermediate. Seed treatments with cold formaldehyde, an organic mercurial, thiosan, and fermate gave no control.

G. C. KENT, I. J. JOHNSON, and C. P. WILSIE studied a disease of brome grass caused by *Xanthomonas translucens*, and characterized by small, water-soaked areas enlarging into yellowish, brownish, or blackish, somewhat translucent, irregular streaks on the leaves, culms, and young seedlings. Injury was greatest on the foliage. Inoculation tests showed that the organism also infected barley, wheat, rye, Erban oats, *Bromus catharticus*, *B. carinatus*, *B. erectus*, and *B. marginatus*. Three isolates from brome grass showed morphological, cultural, and physiological characters resembling those of the strains from wheat, barley, and rye. The brome pathogen overwintered in the foliage in the field and infected new leaves in the spring.

In the section of this report dealing with forestry (pp. 198–201), E. L. WILSON, G. B. MACDONALD, C. J. DRAKE, and I. E. MELHUS state that blister rust [*Cronartium ribicola*: ibid., xxiv, p. 296] was found in Iowa on native white pine in Dubuque County in 1934 and 1938 and on nursery stock in Lyon County in 1917 and in Story County in 1931; it has been found on *Ribes* in 33 counties or one-third of the State. Low temperatures with relatively high humidity are most favourable for the development of the disease. Locally, most of the infection appears to occur on *Ribes* in late summer and autumn; the disease occurred earlier and was more prevalent on *Ribes* in the spring of 1944 than in any previous spring. It seems that much of the infection on *Ribes* each year in Iowa is due to long-distance spread of spores by means of uredinial 'jumps' and aecidial 'showers' from pine-infection centres in Minnesota and Wisconsin.

Fifty-sixth Annual Report of the Vermont Agricultural Experiment Station for the year 1942–43.—*Bull. Vt agric. Exp. Sta.* 508, 37 pp., 4 figs., 1943. [Received June, 1945.]

This report [cf. *R.A.M.*, xxii, p. 239] contains, *inter alia*, the following items of phytopathological interest. R. R. MIDGLEY and D. E. DUNKLESS found that cooked potatoes do not blacken [ibid., xxiii, pp. 40, 76] when commercial fertilizers are generously applied to soils which markedly fix certain plant food constituents. Grown on a soil which readily fixes potash and phosphorus, potatoes often become black and soggy after boiling if potash is not supplied in the fertilizer, assume a steel-grey colour if phosphorus has been omitted, and remain white and mealy if the soil is completely fed. Symptoms resembling leaf roll were produced when healthy potato seed was planted on phosphorus-hungry soil. Potato yields on a phosphorus-fixing soil were almost doubled when lime was freely applied, the crops remaining free from scab [*Actinomyces scabies*].

The same authors state that magnesium deficiency affected one large and several small potato crops during the period under review, only one-third of the yields being normal. Potato fertilizers sold in Vermont should contain soluble magnesium.

B. F. LUTMAN ascertained that scab lesions and browned spots apparently occur on the stems and roots as well as on the tubers. Cultures of soil organisms in a special pectin medium indicated that they seem to survive in the potato plant remains left as humus on the field and in the soil. The age of these humus particles was not determined, but inoculation with one-year-old humus gave positive results. All potato plants should be removed from fields to be replanted to this crop.

LAYCOCK (D. H.). **Preliminary investigations into the function of the endotrophic mycorrhiza of Theobroma cacao L.**—*Trop. Agriculture, Trin.*, xxii, 4, pp. 77–80, 4 figs., 1945.

In this paper, written by W. T. Dale, but based on a dissertation by Laycock, a description is given of a Phycomycetous endotrophic mycorrhizal association in cacao roots from Trinidad, Tobago, and Yaguaraparo, Venezuela. As vesicles and arbuscules were rarely seen in these plants, the mycorrhiza are not classified as the 'vesicular-arbuscular' type [cf. *R.A.M.*, xxiii, p. 402], although such formations may have been prevented by some reaction in the cacao roots themselves. Efforts to isolate the fungus were unsuccessful.

Mycorrhizal density appears to be greater on 'bad' cacao plots than on 'good', but this does not indicate that the fungus is important in the nutrition of the cacao tree, and there was no evidence of parasitic behaviour.

A pot experiment showed that cacao seedlings can germinate and grow equally well either with or without mycorrhiza up to the age of 15 weeks at least. The fungus was found in garden soil in which cacao has not been grown in recent years, and may therefore live in the roots of other plants. It does not appear to be of any outstanding importance in the growth of cacao.

BREMER (H.) & ÖZKAN (MEDIHA). **On cereal rusts in Turkey.**—*Zir. Derg.*, v, 59, pp. 5–12, 1944. [Turkish, with English and German summaries.]

Cereal rust (*Puccinia* spp.) epidemics are liable to occur in most parts of Turkey in years characterized by a wet spring and early summer. The last two years of this type were 1940 and 1943, the former of which was marked by outbreaks of stem [black] rust (*P. graminis*) [*R.A.M.*, xvii, p. 225] in all districts and of stripe [yellow] rust (*P. glumarum*) in some [ibid., xxiii, p. 336], while the latter was noteworthy for a fairly severe attack of yellow rust in the vicinity of Ankara.

P. graminis, the rust with the maximum heat requirements, cannot overwinter on cereals on the Central Anatolian plateau, and in view of the scarcity of bar-

berries the teleuto and aecidial stages are unlikely to contribute to the establishment of epidemics. The main source of inoculum is probably to be sought in the coastal regions, where conditions approximate to those known to permit of uredo hibernation, and whence spores could easily be conveyed by the wind. Heavy black rust infection is to be anticipated when heavy precipitation coincides with normal spring and summer temperatures.

P. glumarum, which needs less warmth than any of the other rusts [ibid., xxiv, p. 141], can certainly survive mild winters on the Central Anatolian plateau, where yellow rust epidemics are to be expected when a fairly cool, wet spring succeeds a mild winter, such as 1936. In 1943 the attack was rather lighter, notwithstanding favourable spring weather, owing to the rigorous preceding winter. In general, *P. glumarum* seems to predominate at high altitudes.

Of late years collections of wheat brown rust (*P. triticina*) and barley dwarf rust (*P. simplex*) [*P. anomala*] have been received only from the coastal districts, where they can overwinter in the uredo stage. Rye brown rust (*P. dispersa*) and crown rust of oats (*P. coronifera*) [*P. coronata*] are of merely local importance in view of the restricted areas of cultivation of their hosts.

Observations on the reactions of 40 wheat varieties to *P. glumarum* during the 1943 epidemic disclosed the existence of two highly resistant, two resistant, and three moderately resistant.

BECKER (HANNA). **Arbeitsweise und Erfolge in der Weizenzüchtung an der Pflanzenzuchtstation der Universität Halle.** [Methods and results in Wheat-breeding at the Plant Breeding Station of Halle University.]—*Kühn-Arch.*, lx, pp. 369–401, 1 col. diag., 1944.

Among the objectives of the wheat-breeding programme at the Halle Plant Breeding Station, of which this is a fully tabulated survey and discussion, is the development of superior winter varieties combining hardiness with partial resistance to yellow, brown, and black rusts [*Puccinia glumarum*, *P. triticina*, and *P. graminis*], of high-yielding varieties resistant to yellow rust, and of strains from the abundant material collected by the German Hindu Kush expedition with sufficient resistance to mildew [*Erysiphe graminis*] to form the basis for further selection [cf. *R.A.M.*, xviii, p. 196 *et passim*].

The problem of breeding for resistance to yellow rust has long been in the foreground, but only at a later date could a comparable approach be made to the study of brown rust [ibid., xvii, p. 733], since no destructive epidemics of this disease occurred in Germany after 1905 and 1908 until 1930–32, inclusive. In the case of yellow rust, with its preference for low temperatures and capacity for infecting young stands in the autumn and during mild winters [ibid., xviii, p. 512; xxiv, p. 141], the main emphasis in breeding is laid on seedling resistance, whereas brown rust does not become widespread until June or July, and the adult stage is therefore the critical period for resistance. American summer wheats, notably Thatcher selections, are the most promising progenitors for the production of brown rust-resistant materials, while Chinese 165 and 166 [ibid., xiii, p. 620] and Ridit are used as parents in crosses directed towards the attainment of resistance to yellow rust. Resistance to black rust is not one of the most urgent aims, *P. graminis* having hitherto been of little importance in central Germany, but it assumed some prominence after the rigorous winter of 1941–2 and is in any case apt to be troublesome in the Alpine regions. Observations were therefore made from 1941 to 1943 at 20 branch stations in different parts of the country on the reactions of eight yellow rust-resistant selections to *P. graminis* as well as to *P. triticina*. Of these, two in particular promise to afford very valuable material for use as the starting points of new crossing operations, namely, 3496_{39} and 3312_{38} (both Thatcher × Kronen).

In the breeding of summer wheats, resistance to loose smut [*Ustilago tritici*], as well as to the yellow and brown rusts and mildew, must be taken into account. In connexion with the first-named, a difficulty has arisen in the recent recognition of a new physiologic race of South American origin in addition to the two already known [ibid., xi, p. 666]. The new race severely attacks certain selections of high or moderate resistance to the other two, e.g., Peragis × Marquis (3574_{28}), Peragis × Kinney × Grüne Dame (8885_{30}), Peragis × Hohenheimer 25f (3890_{30}), and Peragis × Heines Kolben (4185_{30}). A very promising variety, designated Breustedts Teutonenweizen (4453_{31}), is a product of Heines Kolben × R 1004. Its moderate resistance to race 3 of *U. tritici* is an obvious case of transgression, since both parents are more or less susceptible.

Attempts are in progress to combine resistance to the yellow and brown rusts and loose smut with attractive milling and baking qualities, hardiness, productivity, and other desirable features. Of the eight selections tested at different branch stations over a period of years, Ardito × 4185_{30} (3965_{39}) deserves special mention for its virtually complete resistance to *P. glumarum*; it is, however, inferior for baking purposes. The latter observation also applies to Varonne × 4185_{31} (5614_{38}), which is a desirable parent on account of its resistance to both rusts and to loose smut. Of the selections of superior quality, Thatcher × 4453_{31} (6645_{39}) is foremost in resistance to the rusts, while a similar response to loose smut is to be anticipated, though actual evidence to this effect is not yet forthcoming.

Three varieties are being used as parents in crosses aiming at the development of seedling resistance to mildew in summer wheats, viz., H.E. 516 (Hindu Kush), which has served as a partner to two Halle selections, 4453_{31} and 4172_{30}, *Triticum persicum*, and Greek 3. These varieties have withstood infection by all the physiologic races so far tested, including 1, 2, 3, 6, and one observed on Normandy in 1940 [ibid., xix, p. 206]. Breustedts Teutonenweizen is normally resistant to mildew in the field, but in 1940 it also succumbed to the 'Normandy' race, which has not, however, since reappeared, even in 1943, when the disease was prevalent.

BRENTZEL (W. E.). **The black point disease of Wheat.**—*Bull. N. Dak. agric. Exp. Sta.* 330, 14 pp., 2 figs., 1944.

The author describes experiments over a period of five years, 1938–43, into the effect of black point disease [*R.A.M.*, xxiii, p. 222] on several varieties of wheat in North Dakota. Red durum suffered worst, amber durum badly, and the hard wheats least severely, the principal agents responsible being *Alternaria* spp. and *Helminthosporium sativum* [ibid., xxiv, p. 221], the former causing the greater part of the discoloration and *H. sativum* doing most damage. Seed planted after infection with *H. sativum* showed considerably impaired stand and yield in 1943 and much root rot development. Seed infected with *Alternaria* spp. had greater weight than non-infected seed and their germination was not impaired, but seed infected by *H. sativum* regularly became shrivelled on any considerable penetration by the fungus. At the same time, 1942 was the only year in which *H. sativum* appeared as a seed-borne disease in an important amount. Planting seed infected with *Alternaria* spp., either alone or in close proximity to other seed, caused no noticeable development of disease and no reduction in stands of plants or yield. Disinfection of seed affected by *H. sativum* in 1943 resulted in a significant increase of yield, but no consistent betterment of yield has yet resulted from disinfection of seed affected by *Alternaria* black spot.

MEAD (H. W.). **A biological method of detecting the presence of fungicides on seeds.**—*Sci. Agric.*, xxv, 7, pp. 458–460, 1 fig., 1945.

Observations having shown that the conidia of *Helminthosporium sativum* failed to germinate near wheat seeds dusted with ceresan, a method was devised in which

this principle was used to test seed for the presence of ceresan and to determine the percentage of seeds in any treated sample which had received a uniform covering of dust. Agar was poured into Petri dishes and inoculated with a suspension of the spores in water. The seeds (five per dish) were at once placed on the inoculated agar, and the plates were inoculated at 24° C. and examined about 48 hours later. It was then apparent that the fungus had failed to grow round the ceresan-treated seeds, while the untreated seeds were completely surrounded and in many cases overrun by mycelium. When the method was used to test coverage by a seed-treating machine or other means, samples were taken at timed intervals as the seed was being treated, about 20 seeds taken at random being tested from each sample.

The tabulated results showed wide variation in the efficiency of different dusting machines and methods, and some fluctuation in the amount of dust applied; with six different machines, for example, the percentages of seeds dusted (average for 10 samples) ranged from 64 to 100. Tabulated results are also given of tests by Miss A. M. Dickey to determine the inhibitive effect of ceresan and other fungicides on various fungi.

LING (L.) & LI (T. K.). **The fungicidal efficiency of ferrous sulphate and its application as a seed disinfectant of Barley.**—*Chin. J. sci. Agric.*, i, 2, pp. 126–132, 1943. [Received June, 1945.]

In laboratory tests with ferrous sulphate recrystallized from the crude commercial product, the germination of the conidia of *Helminthosporium gramineum*, the agent of barley stripe, and of covered smut [*Ustilago hordei*], was completely arrested at a concentration of 1 per cent. Added to potato dextrose broth cultures at the rate of 0·5 per cent., the compound reduced the mycelial growth of *H. gramineum*, *Penicillium digitatum*, and *P. italicum* by about 60 per cent. as compared with the controls; at 1 per cent. it entirely inhibited the development of the first-named organism.

In field experiments in 1937, the incidence of stripe was reduced from 12·5 to 2·8 per cent. by eight hours' immersion of the barley seed-grain in a 2 per cent. ferrous sulphate solution, while in 1938 the same treatment for 8 to 16 hours at 1 to 3 per cent. resulted in a nearly clean crop, compared with 10·9 per cent. in the control plots. No injury to the seed was caused by the longer period of immersion at concentrations of up to 5 per cent. Four hours' immersion in 5 per cent. ferrous sulphate reduced the amount of infection by *U. hordei* from 10 to 1·4 per cent., a result roughly comparable to that secured by treatment with copper sulphate or formalin but less satisfactory than that given by the organic mercury dusts. Tested against wheat flag smut (*Urocystis tritici*), ferrous sulphate reduced the incidence of infection from 41·3 to 5·6 per cent., but its action on this pathogen is not equal to that of the standard treatments with copper sulphate, formalin, hot water, and mercury dusts.

ZIEGENBEIN (GERTA). **Arbeitsweise und Erfolge in der Hafer- und Gerstenzüchtung an der Pflanzenzuchtstation der Universität Halle.** [Methods and results in Oats and Barley breeding at the Plant Breeding Station of Halle University.] —*Kühn-Arch.*, lx, pp. 440–454, 1 diag., 1944.

For the last 15 years work has been in progress at the Halle Plant Breeding Station on the development of resistance to loose smut [*Ustilago avenae*: *R.A.M.*, xiii, p. 364] in oats. Particularly encouraging results have been secured with crosses having Black Mesdag as one of the parents: in 1943 two resistant selections were due for their final trials by the Reich Food Board, while a further five were still undergoing tests for eligibility. To attain this end some 40,000 seeds of a hybrid population were annually inoculated with a mixture of physiologic races

of loose smut and the non-infected plants set aside. The next year the seed-grain was divided into two lots, one for reinoculation and the other sown in a special plot for observations on the characters of the progeny of individual healthy plants. The appraisal of yielding capacity and other properties of the selected offspring was effected in the following year in immature plots. At the same time a third inoculation was performed. Only after three years' freedom from infection under these conditions is a selection adjudged to be resistant.

There is a wide gulf between the Hindu Kush summer barleys serving as progenitors in crosses directed towards loose smut (*U. nuda*) and stripe disease (*Helminthosporium gramineum*) resistance and the prolific winter-hardy varieties required for Central European conditions. The recent severe winters have necessitated special attention to the development of hardiness, and some selections are already available combining this attribute of the Mahndorfer parent with several years' freedom from one or both diseases, four of which in 1943 approached or surpassed the standard varieties, Mahndorfer and Friedrichswerther, in productivity, viz., 55/22, a derivative of Goldth[orpe]×Haya Rokkaku (I_F 2349×50/41), Friedrichswerther×Mie (I_F 2206–10/41), Kalkreuther×Nepal (I_H 3054–59/41), and 41/22 (descended from Goldthorpe)×Chinko (I_F 3235–54/41).

Promising results have also been obtained in breeding for resistance to mildew [*Erysiphe graminis*: ibid., xx, p. 251; xxiii, p. 11], notably in the case of selection 638_{40}, an exceptionally hardy product of the cross 40_{30} (27_{21}×Friedrichswerther)×Ragusa 416, the yield of which exceeded that of Mahndorfer in 1943.

In the case of summer barleys, resistance to loose smut and stripe disease has not yet been satisfactorily combined with productivity, but further attempts are in progress to develop these and other desirable qualities, such as smooth awnedness, in crosses between Nepal and certain Japanese types and German or American varieties. According to Freisleben (*Kühn-Arch.*, liv, p. 295, 1940), two of the Hindu Kush barleys unite freedom from mildew (physiologic races A to E), loose smut, and stripe disease, and these have been crossed with high-yielding varieties and selections and back-crossed in the F_1 with the prolific parent. Further observations on the progeny of this material are planned.

NEWTON (MARGARET) & JOHNSON (T.). **Physiologic specialisation of Oat stem rust in Canada. I.**—*Canad. J. Res.*, Sect. C, xxii, 10, pp. 201–216, 1 diag., 1 graph, 1944.

Annual surveys of the prevalence of the different physiologic races of oat stem rust (*Puccinia graminis avenae*) carried out in Canada since 1921 have shown that races 1, 2, and 5 comprised the bulk of the isolates, 12 races being identified in all up to the end of 1943. The predominance of races 1, 2, and 5 has been greatest in the Prairie Provinces, where barberry is practically non-existent, and may be related to the fact that these races produce teleutospores later and so continue to yield uredospores for a longer time. In regions where barberry is present other races of greater range of pathogenicity have been found more frequently. The occurrence of such races was, however, only sporadic until 1943, when races 8, 10, and 11 were widely distributed, apparently owing to uredospores blown in from the south. The isolates of races 8, 10, and 11 collected in 1943 differ from those of earlier years in showing a pronounced delay in teleutospore formation. An analytical key is given for the differentiation of the races of the rust, using the varieties White Tartar, Richland, and Sevenothree, and a table supplied of the infection types produced on seedling leaves of these.

The effect of environment on the behaviour and therefore the ease of identification of physiologic races is shown in a table by the seasonal influences of the reaction of Sevenothree to races 1 and 11. On this variety the characteristic type 1 reaction is often replaced in summer by type X. It is also shown that, although adult White Tartar and Richland remained resistant when exposed to

a temperature of about 80° F., the resistance of some Hayira crosses broke down under the same conditions. The possibility of the spontaneous appearance of another race is also discussed. In some cases the power to produce a heavy type of infection is recessive and it may be possible that the crossing of two races between types, neither strongly infective, might produce a highly infective race. For example, it has been found that race 8 which attacks White Tartar only weakly may produce aecidiospores on barberry which eventually give rise to uredospores of race 6 which attack White Tartar heavily. The possibility of mutations occurring is of importance, but unless the mutation occurs repeatedly it is difficult to distinguish it from contamination with another race. The authors describe experiments in which race 7 appeared to arise spontaneously and repeatedly from race 3. The possibility of future changes in the pathogenicity of the rust necessitates an adequate annual survey of physiologic races and further development of rust-resisting varieties of the oat.

KOCH (L. W.) & MURWIN (H. F.). **The Hybrid Corn industry in Ontario: pathological and other problems.**—*Emp. J. exp. Agric.*, xiii, 50, pp. 100–111, 3 pl., 1 map, 1945.

During recent years approximately 75 per cent. of the total acreage of maize in Canada has been concentrated in Ontario, where the open-pollinated varieties in use before 1939 have been almost completely replaced by hybrids to meet the increasing demand for hybrid varieties suited to Canadian conditions. A large-scale breeding programme was initiated at the Harrow Dominion Experimental Station and, since the loss from disease is a factor of economic importance, it was realized that pathological studies must of necessity be integrated with the breeding programme. Hybrids, unlike open-pollinated varieties, are either uniformly susceptible or uniformly resistant to disease.

Generally speaking, seedling diseases, caused by species of *Pythium*, *Helminthosporium*, and *Fusarium* [*R.A.M.*, xxi, p. 448], are the most important maize diseases in Ontario, where surveys have shown ear and stalk rots caused by *Diplodia zeae* (the most virulent pathogen), *Fusarium moniliforme* [*Gibberella fujikuroi*], *G. zeae*, and *Nigrospora sphaerica* (the least virulent) to be destructive. Rust (*Puccinia sorghi*) and smut (*Ustilago maydis*) also occur.

The technique finally adopted for testing resistance to ear and stalk rots consisted in puncturing an internode about 1 ft. above ground-level with a blunt wire and interjecting 10 c.c. of a spore and mycelial suspension of the pathogen, series of inoculations being made in July, mid-August (at the early silking stage), and in September (milk stage). In the third series, *D. zeae* consistently caused up to five times more injury after two weeks than in either of the earlier series.

The paper gives brief accounts of the above diseases and includes a list of hybrids recommended for use in Ontario, which show considerable resistance to disease, lodging, and corn-borer attack.

STEVENS (N. E.). **Distribution of Diplodia zeae and D. macrospora in the United States.**—*Trans. Ill. Acad. Sci.*, xxxvi, 2, pp. 107–108, 1 map, 1943. [Received June, 1945.]

Two apparently closely related species of *Diplodia* are responsible for ear rots of maize in the United States, namely, *D. zeae*, first reported in 1822, and *D. macrospora*, originally described in 1897 [*R.A.M.*, xxi, p. 285]. In culture the latter fungus appears to be decidedly inferior to the former, having a narrower temperature range, sporulating less freely, and depending on external sources for the biotin essential to its growth [ibid., xvi, p. 245]. Moreover, in the United States, at any rate, the geographical range of *D. macrospora* is more limited than that of *D. zeae*. The latter has been reported from California and every State east

of the Rocky Mountains except the three northern New England States, whereas the former, apart from one record in Connecticut and two in Delaware, has been notified only from the south-eastern States.

During February and March, 1943, the author collected material of both species in Tennessee, Mississippi, Louisiana, Texas, and Oklahoma, and the results have been combined with previous observations by himself and others, covering a period of several years, to give the following figures: Alabama 425 collections, Florida 975, Georgia 175, Kentucky 254, Louisiana 79, Mississippi 233, Oklahoma 157, South Carolina 123, Tennessee 1,148, and Texas 60 [cf. ibid., xviii, p. 17].

SLAGG (C. M.), LIVINGSTON (J. E.), & SWINBANK (J. C.). **Moisture content and development of molds in Corn stored under various conditions in three eastern Nebraska counties during the winter of 1944–45.**—*Plant Dis. Reptr*, xxix, 11, pp. 282–285, 1945. [Mimeographed.]

A considerable part of the record crop of 329,855,000 bush. maize in Nebraska in 1944 had to be stored in temporary cribs and in piles on the ground. Early winter-marketing of temporarily stored maize was impossible owing to the size of the crop interfering with shelling and the lack of transport, and an unusually wet winter, encouraging mould, led to serious losses.

The senior author found that deterioration was evident in February in some permanent cribs as well as in temporary cribs and piles in the open, but maize in some piles on the ground without protection of any kind was found in good condition. Maize damp or not fully ripened at the time of cribbing was found to be still wet in the centre of the crib in mid-March, 1945, regardless of the type of crib, and maize which was dry at cribbing still had a low moisture content. Mould development was highest in maize carrying a high moisture content when cribbed and regardless of the type of crib. The general conclusion reached was that the winter of 1944–5 in Nebraska was not conducive to drying of ear maize in cribs. Maize with less than 21 per cent. moisture when cribbed kept satisfactorily, while 27 per cent. moisture exposed grain to mould attack. Some drying was observed in the outer portions of cribs in maize stored with a moisture content above 27 per cent. The drier samples from such cribs contained about 24 per cent. moisture.

GOWEN (J. W.). **Genetic aspects of virulence in bacteria and viruses.**—*Ann. Mo. bot. Gdn*, xxxii, 2, pp. 187–211, 6 figs., 1945.

The author expresses the view that disease is caused by the interaction of four major variables: the genetic constitution of the host for disease susceptibility or resistance, of the pathogen for virulence or avirulence, the dose to which the host is exposed, and the many variables conventionally classed as environmental effects.

In the course of the work reviewed in this paper two different lines of the maize-wilt organism (*Phytomonas* [*Xanthomonas*] *stewarti*) [*R.A.M.*, xxi, p. 523] were examined for phenotypical variants in the original pure stock and for mutations occurring naturally and after irradiation with X-rays. One of these lines, a dark yellow, rough type with medium-sized colony, showed three progeny mutants below and nine above the parent's rather low virulence index of 31. When the original parent stock is rather low in virulence, a mutant is frequently more virulent in type. The indexes ranged up to 70 with an average of 45. Seven of nine mutants of the second line, a large colony with a diffuse centre, showed indexes below that of the parent (index 75) and two had indexes above (81 and 78), the average virulence being 62. The author cites the results of Holmes's studies on mutations derived respectively from a masked and a distorting strain of tobacco virus [ibid., xvi, p. 129], which agree with his experiments on *X. stewarti* in showing a persistence of virulence type even with marked changes in other characteristics.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1943–44*, Part II, pp. 62–66, [? 1945.]

In this report [cf. *R.A.M.*, xxiii, p. 331] R. H. Porter and W. N. Rice state (p. 38) that during the period under review *Fusarium graminearum* [*Gibberella zeae*], and species of *Helminthosporium*, *Curvularia*, and *Epicoccum* were isolated from seed of sorghum, oats, and timothy [*Phleum pratense*] in Iowa. The pathogenicity of these isolates is being investigated.

A test was made of the germination of seed of eight varieties of spinach (untreated, and treated with arasan, fermate, and zinc oxide) in sterilized sand at 10° C., in *Pythium*-infested soil at 10°, and in the field. In sterile sand the germinability of the untreated seeds ranged from 88 to 97 per cent., and that of the arasan, fermate, and zinc oxide-treated seeds from 91 to 97, 88 to 98, and 87 to 98 per cent., respectively; in the infested soil the corresponding figures were 23·5 to 78, 70 to 87·5, 42·5 to 77·5, and 67·7 to 88·5 per cent.; while in the field they were 25·2 to 48·4, 41·6 to 64, 43·4 to 60·6, and 48·6 to 56·4 per cent. When 17 lots (five varieties) of sweet corn seed treated with arasan, barbak DX, untreated, and treated with spergon were grown in *Pythium*-infested soil for seven days at 10°, the germination ranged from 65 to 93·5, 9·8 to 72·3, 9·3 to 65·5, and 54·8 to 88·8 per cent., respectively. In general, seed dried in the ear offered more resistance to *Pythium* at 10° in this test than did seed combined before drying. In other similar tests against *Pythium*, arasan and zinc oxide gave better protection to spinach seed than did fermate, while arasan and spergon were far better than barbak DX as a protectant for sweet corn seed.

I. E. Melhus and G. C. Kent (p. 62) state that further improvement was made in methods of testing maize for reaction to *Ustilago zeae* [*U. maydis*] in the seedling stage [ibid., xxiii, p. 332] by inoculating before emergence. The seeds were sprouted on moist blotters, and then inoculated hypodermically with a matched pair of sporidia in carrot decoction. The sporidial suspension was injected directly into the growing point on the cotyledonary node. The seedlings were then transplanted into sand in flats in the greenhouse or grown on blotters under bell jars in the laboratory. The percentage of infection obtained decreased as the coleoptiles were allowed to grow further before injection. Maize seed soaked in water for 48 hours and inoculated before emergence of the coleoptile gave a very high percentage of infection. Seedlings inoculated when the coleoptile had extended $\frac{1}{4}$ to $\frac{1}{2}$ cm. out from the seed coat usually developed definite galling in three days. Records were made after seven days, when all the symptoms were in evidence. All the varieties tested, including strains from Mexico and crosses from these on to Corn Belt inbreds, showed a uniformly high percentage of infection.

G. Semeniuk, C. S. Reddy, I. E. Melhus, W. E. Loomis, E. W. Lindstrom, and G. F. Sprague (p. 62) studied the disease incidence in the field on the mesocotyls and primary roots of maize plants about $2\frac{1}{2}$ ft. high raised from seed of Illinois Hybrid 960 and a composite mixture of ten commercially grown hybrids. The seeds were planted on five different dates, beginning on 22nd April, 1943, and continuing at ten-day intervals.

Disease development was worse with each successive planting. Incidence was higher on the mixed hybrids than on Illinois Hybrid 960. Benefits from seed treatments in disease reduction were noted at all planting dates, though not all the benefits were significant. Reductions of disease on primary roots were less frequent, occurring chiefly in the two earliest plantings. Semesan jr. gave the best results of the materials tested in reducing disease on the mesocotyls, while spergon and arasan came next. Semesan jr. gave some reduction of disease on the primary roots. Isolations from the diseased mesocotyl tissues from the first, third, fourth, and fifth plantings yielded predominantly *Fusarium moniliforme* [*G. fujikuroi*],

alone or together with *Trichoderma* sp. and with or without an unidentified chlamydospore-producing organism found abundantly on the roots. Diseased primary roots from the first- and last-planted plots gave chiefly *Helminthosporium* sp. and *G. fujikuroi*, while those from the third and fourth dates-of-planting plots gave mostly an unidentified chlamydospore-producing organism, followed by *Helminthosporium* sp. and *G. fujikuroi*. All three organisms were usually found in association, with *Helminthosporium* dominant.

BLISS (D. E.). **Controlling Armillaria root rot in Citrus.**—*Calif. Citrogr.*, xxx, 5, pp. 130–131, 154–155, 7 figs., 1945.

This is a verbatim presentation of a report which has been previously noticed [*R.A.M.*, xxiv, p. 225].

CHAPMAN (H. D.), BROWN (S. M.), & RAYNER (D. S.). **Nutrient deficiencies of Citrus.**—*Calif. Citrogr.*, xxx, 6, pp. 162–163; 7, pp. 198–199, 216–217; 8, pp. 230–231, 246–248; 11 figs., 1945.

In the first of this series of articles on the symptoms, causes, and control of mineral deficiencies of citrus, the authors describe in outline the nature of the mineral element requirements of citrus [see next abstract] and discuss iron chlorosis [cf. *R.A.M.*, xx, p. 461]. The second paper deals with deficiencies of manganese, zinc, and copper, and the third and final with those of nitrogen, phosphorus, and sulphur.

CHAPMAN (H. D.) & KELLEY (W. P.). **The mineral nutrition of Citrus.** *Ex* **The Citrus industry Volume I: history, botany, and breeding. First edition.**—pp. 719–766, 3 col. pl., 18 figs., University of California Press, 1943. [Received June, 1945.]

The chapter (VII) contributed by the writers to the book with the above-mentioned title by H. J. Webber and E. D. Batchelor comprises, *inter alia*, a discussion of the mineral composition of citrus and its plant-food requirements [see preceding abstract], with special emphasis on the effects of deficiencies and excesses [*R.A.M.*, xxiii, p. 386].

BERTELLI (J. C.) & BERTELLI (LUCIA K. DE). **Notas fitopatológicas. Estudio etiológico de la 'podredumbre de las raicillas' o 'tristeza' de los Citros.** [Phytopathological notes. An etiological study of the 'root rot' or 'tristeza' of Citrus.]—*Rev. Asoc. Ing. Agrón.*, xvii, 1, pp. 15–32, 8 pl., 1945. [English summary.]

Pursuing their studies on citrus root rot ('tristeza') in Salto, Uruguay [*R.A.M.*, xxiv, p. 98], the writers observed the associated species of *Lasiodiplodia* or *Botryodiplodia* on adult mandarin and sweet orange trees grafted on sour orange stocks. Its penetration was effected exclusively through lesions in the woody tissues of enfeebled sweet and sour orange trees. The possibility is envisaged of a causal connexion between the fungus and the death of the trees from exhaustion consequent on vascular obstruction and depletion of the starchy reserves in the union zone of scion and stock. These features of the symptomatology of the disease differ from those previously described in connexion with 'tristeza'.

A virus thought to be possibly identical with that of the type of psorosis found in Corrientes, Argentina, was detected in the foliage of diseased sweet orange trees grafted on sour stocks; of four to five-year-old sour oranges, attempts at the grafting of which were unsuccessful; of recovering nursery mandarins grafted on sour stocks; and of healthy sweet oranges grafted on stocks of the same species. Normally latent, the virus assumes a pathogenic habit in the sweet orange scion-sour orange stock combination.

MARTYN (E. B.). **Coconut diseases in Jamaica. (1) Bronze leaf wilt and other diseases affecting the bud of Coconuts. (2) Diseases affecting the leaves, crown and stem of Coconuts.**—*Trop. Agriculture, Trin.*, xxii, 3, pp. 51–59; 4, pp. 69–76, 3 figs., 1 map, 1945.

Following an outline of coco-nut cultivation in Jamaica the author classifies the coco-nut diseases present as follows: (i) those causing rapid death of the bud: bronze leaf wilt [*R.A.M.*, xxi, p. 242; xxii, p. 237], bud rot (*Phytopthora palmivora*) [ibid., xx, p. 200], and lightning strike; (ii) diseases affecting the emerging leaves, usually without killing the bud: bitten leaf [ibid., xxii, p. 197] and St. Mary disease; (iii) diseases affecting the appearance of the whole crown or of the outer leaves, but not causing the death of the palm immediately: leaf spots, drought wilt, leaf-break, yellowing, little leaf, and false wilt; (iv) diseases of the stem: stem-bleeding and leaf-scar disease.

Bronze leaf, although present in small areas, is the most serious of the coco-nut diseases of Jamaica and has entirely destroyed many of the plantations along the almost continuous belt of coco-nuts between Montego Bay and Lance's Bay. The disease has apparently not yet been recognized outside the Caribbean region. Local observations throw doubt on the theory that bronze leaf is a non-parasitic wilt, and therefore, pending a true diagnosis, it should be regarded as infectious, and diseased trees should be cut down and their crowns burnt. The disease does not appear to be a true wilt, in so far as that term denotes a condition brought about by lack of water [ibid., xx, p. 112]. An examination of the symptoms at various stages suggests that the causal factors initiate a breakdown of the tissues in the young flowering parts and growing leaves, which fall a prey to saprophytic bacteria, multiplying rapidly and setting up the ill-smelling rot which eventually assails the heart. Attempts to reproduce the disease artificially by inoculation with bacteria taken from the dying heart have failed. The disease affects palms of all ages, on different soils and in both wet and dry seasons, and may cause a mortality of 90 per cent. on 30-year-old plantations, a behaviour scarcely to be attributed to a non-parasitic agency. At the same time, the tendency of the disease to spread in the direction of the prevailing wind may be compatible with a virus origin, with an air-borne vector.

P. palmivora also attacks palms of all ages, particularly under very humid conditions and after hurricanes, when it is not always practical to apply prophylactic measures. It is not easy to detect in the early stages and may pass unnoticed until the sudden collapse of the outer leaves.

Palms killed by lightning show a collapsed crown and exudation from the stem, which is soon attacked by boring insects. The trees should be cut down, burnt, and replaced.

The remaining diseases of coco-nuts in Jamaica, apart from false wilt, which is of genetical origin, are all attributable to environment, and a suitable choice of planting sites will prevent their doing serious damage. The genus *Phytophthora* can be definitely associated with some of them, although in most cases only as secondary invaders of tissues already weakened by other causes. Symptoms such as internal lesions of the trunk and mid-ribs, withering of the inflorescences, an unhealthy appearance of the endosperm, or a partial shedding of nuts, may be found associated with palms in the unthrifty conditions related to St. Mary disease. In all these cases, however, palms can be restored to health with suitable treatment.

In the case of bitten leaf, lesions caused by experimental manipulation of the heart have been found infected with *Thielaviopsis* [*Ceratostomella*] *paradoxa*. This is not, in the author's view, a primary cause of any form of bitten leaf, but the symptoms reproduced are entirely comparable with the 'hard' and 'pineapple-leaf' types of bitten disease ascribed to *C. paradoxa*. He agrees with Briton-Jones

[loc. cit.] that *P. palmivora* may often cause the subsequent appearance of bitten leaf, which may also be aggravated by beetles or other insects. Rain trickling down the leaves and wetting the inside of the central column and the heart tissues below encourages primary or secondary fungal attack on tissues mechanically damaged or previously parasitized. Sometimes *C. paradoxa* is present in a secondary role, while at others the damaged tissues react by a type of gum formation that inhibits fungi. When the final symptoms are observed, however, it is not always possible to determine the original cause with certainty. In normal years the rarity of the disease results in its often being overlooked. Sometimes natural recovery takes place, and sometimes the bud is affected and death results. Excision of all diseased tissues and treatment of the remainder of the heart with a fungicide is the generally accepted remedy.

Apropos of St. Mary disease, the author observes that he has seen several diseases of the maturing leaves with symptoms similar to those described by Smith [ibid., xii, p. 90]—brown and sometimes ashen discoloration of the pinnae with gum oozing from slight lesions. The symptoms are found in areas of high rainfall or after an abnormally wet season, and are associated with soils unsuitable for coco-nut-growing or temporarily sodden by heavy rain.

Stem diseases are unimportant, and no definite root diseases of the coco-nut palm in Jamaica are known to be caused by any fungus. Several diseases are clearly related to soil conditions. There is much to be discovered as to the exact relationship between the various unhealthy symptoms shown by the leaves, the fall or otherwise in the yield of the nuts, and the soil conditions responsible. Phosphate deficiency, for example, is apparently correlated with marked chlorosis of the leaves, and may in other cases cause a reduction in or even the absence of nuts on palms otherwise healthy.

A key to the diseases of coco-nut palms in Jamaica is appended together with bibliographical references.

ORIAN (G.). **Bud rot of the Royal Palm in Mauritius caused by Bacterium vasculorum (Cobb) Greig Smith. (A preliminary report.)**—*Rev. agric. Maurice*, xxiv, 2, pp. 85–86, 1945.

From bud rot of royal palm (*Roystonea regia*) in Mauritius the author isolated an organism morphologically and physiologically identical with *Bacterium* [*Xanthomonas*] *vasculorum*, and inoculations with the isolate into sugar-cane, maize, and *Thysanolaena maxima* [*T. agrostis* Rees: *R.A.M.* xx, p. 381] gave stripes characteristic of the sugar-cane pathogen. It is, therefore, concluded that bud rot of royal palm in Mauritius is caused by *X. vasculorum*, and that a new host of sugar-cane gumming disease has been discovered in the island.

THOROLD (C. A.). **Elgon dieback disease of Coffee.**—*E. Afr. agric. J.*, x, 4, pp. 198–206, 2 figs., 1945.

Studies on Elgon die-back of coffee [*R.A.M.*, xvi, p. 796; xviii, p. 438] in Kenya showed that in its mildest form it is little more than a severe case of the 'black tip' appearance associated with 'hot and cold' disease. It is typical of Elgon die-back to find a blackening at the base of the large leaves, as well as at the tip of the stem or branch, as in 'hot and cold'. At the other extreme, the disease resembles the death of branches from over-bearing or loss of leaf. The main difference is that in Elgon die-back a few leaves remain, usually at the tip of the branch, when the condition is first noticed. In ordinary die-back, the branch dies only when almost bare.

Fungi isolated from diseased material, including *Phoma* sp. and *Colletotrichum coffeanum* [*Glomerella cingulata*: cf. ibid., xv, p. 214], were used to inoculate healthy stems, but in no case did the disease result, and it was concluded that such fungi

were secondary organisms. The removal of affected shoots was not effective as a means of control.

Both Elgon die-back and 'hot and cold' were amenable to shade, whether artificial or natural, and it was also found that the bronze-tip and broad-leaf type of coffee is resistant to both disorders. Differences in manner of growth between shaded and unshaded trees were found to correspond with similar differences between resistant and susceptible trees when grown without shade. The condition generally developed in stems where premature leaf-shedding had occurred, and it was also produced by artificial defoliation.

In the author's opinion Elgon die-back and 'hot and cold' are causally associated with carbohydrate deficiencies occurring, under the local soil conditions, where coffee is grown without shade.

Susceptible-type trees in a plantation can be rendered resistant by grafting on to them scions from bronze-tip and broad-leaf trees, or by approach grafting with seedlings of such trees—an operation that can be carried out by natives after short training. The best way to control Elgon die-back and 'hot and cold' is to establish shade trees. *Entada abyssinica* is recommended for this purpose and it is desirable when a new variety is to be planted to use some type of coffee known to produce good-quality beans, e.g., Blue Mountain, which is resistant to coffee berry disease [*G. cingulata*: ibid., vi, p. 78; xviii, pp. 21, 519].

In a footnote by S. G[ILLETT] appended to this paper it is stated that areas of the resistant type of coffee (bronze-tip, broad-leaf) on exposed sites have recently succumbed to Elgon die-back. Windbreaks should be planted on all such exposed areas. Also, Blue Mountain does not produce economic crops under heavy shade. Where Elgon die-back and berry disease are present, this variety should be planted, but with a very light canopy of shade.

LEHMAN (S. G.). **Treat Cotton seed.**—*Res. & Fmg*, iii, *Progr. Rep.* 3, p. 5, 1 fig., 1945.

Germination and disease tests on several lots of cotton seed grown in eastern North Carolina in 1944 showed that half or more of the seeds of each carried anthracnose [*Glomerella gossypii*] spores. A considerable amount of seed may be saved by treatment with new improved ceresan at the rate of 1 to 1½ oz. per bush., costing 5 to 8 cents per bush. In a number of tests on seed of 85 to 90 per cent. germination, planting five treated seeds per hill in hills spaced 12 in. apart (2½ pecks per acre) produced adequate stands for maximum yields, whereas many growers have thought it necessary to plant 10 to 12 seeds per ft. to secure comparable results with untreated material. Directions are given for a simple method of dusting in a barrel or drum.

THOMAS (K. M.), RAMAKRISHNAN (T. S.), & SRINIVASAN (K. V.). **The natural occurrence of ergot in South India.**—*Proc. Indian Acad. Sci.*, xxi, 2, pp. 93–100, 1 pl., 7 figs., 1945.

The successful production of rye ergot at the Agricultural Research Station, Nanjanad, Nilgiris, in 1941–2, encouraged the expansion of the scheme, in connexion with which a survey was conducted on the Nilgiri plateau, parts of Wynaad and Kodaikanal (Malabar), and Anamalais (Coimbatore) for indigenous species of *Claviceps*. Eighteen grasses were found to be infected, of which 15 are new records, the sphacelial and sclerotial stages being present on 12, while only the former occurred on the remainder [cf. *R.A.M.*, xxiv, p. 234]. The fungi were tentatively classified in four groups on the basis of their conidial characters, viz., (1) curved or fusoid conidia, sclerotia formed, (*a*) smaller conidia (10·9 to 17·6 by 4·6 μ), whitish honeydew, (*b*) larger conidia (20·4 by 8·8), dark honeydew; (2) mostly triangular conidia, 10·4 to 14·6 by 4·9 to 6·6 μ, sclerotia usually formed;

(3) presumably representing *C. purpurea*, oval or round conidia, 4 to 7·4 by 2 to 3·9 μ, sclerotia developed; (4) oblong conidia, 8·7 to 13 by 4·4 to 5·8 μ, sphacelial stage only. The hosts of group (1*a*) are *Cynodon dactylon* [ibid., xxiv, p. 104], *Urochloa reptans*, *Digitaria chinensis*, and *Apluda aristata*; of (1*b*), *Pennisetum hohenackeri* (*P. alopecuros*) [ibid., vi, p. 91]; of (2), *Chrysopogon zeylanicus*, *Heteropogon contortus*, and *Cymbopogon polyneuros*; of (3), *Brachypodium sylvaticum*, *Oplismenus compositus* [ibid., xxiii, p. 65], *Agrostis pilosula*, *Amphilophis foulkesii*, *A. insculpta*, and *Thaneda quadrivalvis*; and of (4), *T. triandra*, *Ischaemum aristatum*, *Andropogon lividus*, and *C. flexuosus*.

FORSYTH (D. D.) & VOGEL (O. A.). **Effect of seed coat injuries during threshing on emergence of Flax seedlings.**—*J. Amer. Soc. Agron.*, xxxvii, 5, pp. 387–393, 1945.

Two important causes of the annual variation in the initial stands of flax obtained at the Washington Agricultural Experiment Station were found to be mechanical damage to the seed, mainly from machine threshing, and the presence of soil-borne organisms, principally *Fusarium oxysporum*. The problem of poor emergence was less acute in the soils from five other localities in the State on which tests were performed than at Pullman, where agents of seed decay and pre-emergence damping-off appear to be exceptionally prevalent.

COLHOUN (J.). **The prevention of seed-borne diseases of Flax. III. The dusting, short wet, and fixation methods of seed disinfection in relation to storage of the seed.**—*Ann. appl. Biol.*, xxxii, 1, pp. 34–37, 5 graphs, 1945.

To determine the effect of the dusting, short wet, and fixation methods of disinfecting flax seed [cf. *R.A.M.*, xxiv, p. 191] upon the germination of stored seed, the author carried out an experiment in which Liral Crown seed with a moisture content of 7·2 per cent. was subjected in lots of 1 cwt. to the following treatments: nomersan 12 oz., ceresan U 564, 4 per cent., 0·9 gal., same at 8 per cent., 0·45 and 0·9 gal., and ceresan 1875 A 12 oz. fixed with separated milk, 0·9 gal. One lot of seed remained untreated, as control. The seed was bagged immediately after treatment, except that with the short wet or fixation method the sacks were sewn up two hours after treatment. The results showed that the moisture content of the seeds immediately after treatment was, respectively, 7·2, 13·8, 10·6, 14, 13·5, and that of the control 7·2 per cent., while the germination after 14 months' storage was, respectively, 98, 97, 92, 78, 89, and 95 per cent.

Since 1940, all the sowing flax seed produced in Northern Ireland has been treated with nomersan by the dusting method and in no case has viability been reduced during storage for 18 months after treatment.

In a second experiment, 1 cwt. lots of Liral Dominion seed from the same crop containing, respectively, 5·8, 8·7, 10·4, 11·8, and 13·2 per cent. moisture were treated with ceresan U 564 (8 per cent., 0·9 and 0·67 gal.), and ceresan U.T. 1875 A (12 oz. fixed with 0·9 gal. separated milk), one sample from each lot being left untreated. The results showed that after about six months in commercial storage the moisture content of each lot, irrespective of treatment and of the initial moisture content, became stabilized at about 10 to 12 per cent. The untreated seed at all the moisture contents used continued to germinate well after 13 months in storage, though after a further 12 months' germination was in most cases low. In general, treatment reduced viability in storage, and the higher the moisture content was before treatment, the sooner this effect became apparent. Seed with an initial moisture content of 5·8 per cent. treated with ceresan U 564 did not show any serious reduction in germination until after about six months' storage.

In both 1943 and 1944, about 10 tons of seed was disinfected by the short wet method, using ceresan U 564 (8 per cent. at 0·67 gal. per cwt.), the moisture

content before treatment being between 5 and 6 per cent. The seed was mostly sown about three months after treatment, and no ill effects on the crop were observed, but one bag, stored for 12 months, showed 76 per cent. germination, as against an initial value of 95 per cent.

MILLIKAN (C. R.). **Iron deficiency chlorosis of Flax.**—*J. Dep. Agric. Vict.*, xliii, 3, pp. 133–134, 1 fig., 1945.

During 1943, flax at Westmere, Victoria, developed a condition in which the new leaves were yellow to white; subsequent growth was very retarded, and the tops of the plants assumed a rosetted appearance, resulting from the shortening of the internodes between the leaves. Many plants died, leaving large bare patches in the crop, and the remainder did not make much growth. In October, the surviving plants began to recover, apparently with the onset of warmer, drier weather, and finally reached a height of about 20 in. in the following winter (May).

The results obtained by growing plants in affected soil in pots showed that soil treatment with potassium, manganese, zinc, or boron salts had no effect on the incidence of chlorosis. Plants dressed with iron sulphate at 5 cwt. per acre were normal, while those given a lighter dressing (56 lb. per acre) showed some chlorosis, but less than the controls. Spraying with a 1 per cent. solution of iron sulphate cured the chlorosis, the development of green colour in the leaves becoming noticeable four days after treatment. Marked chlorosis developed in plants sown in winter, whereas plants grown in the same pots in summer were normal. It seems evident, therefore, that there was an increased amount of iron available to the plants in summer.

REINKING (O. A.). **Diseases of Roselle fiber plants in El Salvador.**—*Plant Dis. Reptr*, xxix, 16, pp. 411–414, 1945. [Mimeographed.]

Preliminary observations on the roselle (*Hibiscus sabdariffa* var. *altissima*) disease situation in El Salvador, made in January, 1943, showed the presence of a *Cercospora* leaf spot (on dry material collected the previous June), a stem canker, *Phoma* leaf spot and canker, a pod and seed disease, and a *Rhizoctonia* rot of a few older stems.

Only a few cases of stem canker were found, the lesion being greyish-yellow in the centre, with concentric, grey rings and a reddish border. The canker girdles the stem, killing the upper parts of the plant and reducing fibre and seed production. In every instance a *Sclerotinia*, to which the disease is tentatively attributed, was isolated from affected material in an almost pure state.

The pod and seed disease, characterized by death of the pods and of some of the seeds, is also provisionally attributed to the *Sclerotinia*. The condition was reported to be most common on floral parts near the ground, often below stem cankers, where damp conditions, which favour *Sclerotinia*, prevail.

The *Phoma* leaf spot is not of a serious nature. A stem canker originating at the base of a pod was found to be covered with spores of the *Phoma*. Apparently, the latter phase of the disease is less prevalent than the leaf spot.

REINKING (O. A.). **Preliminary studies of Abacá diseases in Panama.**—*Plant Dis. Reptr*, xxix, 15, pp. 390–393, 1945. [Mimeographed.]

An inspection made by the author in January, 1943, of abacá [*Musa textilis*] plantings in Panama, showed that infection by *Fusarium oxysporum* var. *cubense* [cf. *R.A.M.*, xix, p. 707] was rare on infected banana soil. A so-called stalk rot is characterized by a rot of the leaf bases, usually beginning at the axil, and progressing downwards. The outer, older leaves rot, and produce a collar rot that chokes the plant. Affected plants are stunted and do not fruit. In advanced cases, the top of the plant falls over. Rotted spots occur in the lower part of the pseudo-stem.

The rotted areas extend through the first leaf sheath into the second and sometimes into the third. The outer diseased and dead leaves are generally covered by a white fungal growth, apparently secondary. When top infection is severe, the upper part of the plant is ruined for fibre extraction. Where the disease was severe, growth was found to be very rank and succulent, and it is believed that the trouble may not be serious in normally cleaned and pruned abacá. It appears to be due to a weak parasite that attacks enfeebled leaves, cementing them together and thereby causing secondary collar rot. Improved pruning methods should eliminate the condition.

One area of Bungulanon plants was stunted and weak. The tops were healthy, but the weakened plants could be pulled over easily, owing to the rotted root system. The trouble appears to have been due to some local soil or drainage condition.

BRIERLEY (P.). **Viruses described primarily on ornamental or miscellaneous plants, II.**—*Plant Dis. Reptr, Suppl.* 158, pp. 168–200, 1945. [Mimeographed.]

This supplementary list of viruses of ornamental and other plants [*R.A.M.*, xxiii, p. 438] includes *Arabis* mosaic, aster yellows, California aster yellows, tea phloem necrosis, hemp streak, papaw mosaic, *Cuscuta* latent, *Dahlia* mosaic, carnation mosaic and streak, *Justicia* virescence, *Levisticum* mosaic, lily rosette, cassava brown streak and mosaic, mulberry mosaic, abacá bunchy top, banana bunchy top, flowering cherry banded-chlorosis, locust (*Robinia*) brooming, rose mosaic, sandal leaf curl, streak, and wilt, sandal leaf curl and spike, cineraria mosaic, *Stachytarpheta* mosaic, *Stachytarpheta* rosette, *Stachytarpheta* spike, cacao red mottle, cacao swollen shoot, cacao vein-clearing, elm phloem necrosis, and *Zizyphus* spike viruses.

WATSON (R. D.). **Aster yellows and its insect vector in Texas.**—*Plant Dis. Reptr*, xxix, 12, pp. 317–319, 1945. [Mimeographed.]

Studies in the ecology of the aster yellows virus disease [*R.A.M.*, xxiv, p. 420] and its insect vector, *Macrosteles divisus*, show aster yellows as present uniformly on weeds, especially *Lactuca* and *Parthenium*, on marketable carrots, when infection usually means their becoming a total loss, on the Great Lakes variety of lettuce, which became 68 per cent. infected, onions (1 to 2 per cent.), and a trace on spinach. Formerly of no great importance, the disease reached a peak in 1943–4, when 80 to 90 per cent. of the carrots were infected.

An interesting factor was the striking absence of infection in weeds and carrot fields in the Lower Rio Grande valley, particularly in view of the fact that the susceptible weeds *Lactuca* and *Parthenium* were very common. The disease did not become common until country further from the coast was reached. Overwintering of the virus in weeds from north to south is indicated by the presence of the disease from Dallas west and south to Laredo. There was little in east Texas.

Aster yellows seems more common and abundant near towns and cities, except in the Winter Garden region, where it is uniformly distributed in weeds throughout the urban and rural area.

BROOKS (F. T.). **Notes on the pathogenicity of Myrothecium roridum Tode ex Fr.**—*Trans. Brit. mycol. Soc.* xxvii, 3–4, pp. 155–157, 1945.

The author describes a series of inoculation experiments with three isolates of *Myrothecium roridum* derived from diseased plants of *Antirrhinum* [*R.A.M.*, xxiii, p. 191] and lupin, and from potato haulms which had been killed by eelworms.

The first was pathogenic to a number of garden flowers and to tomato, but not to potato. The lupin isolate attacked *Antirrhinum* and was more pathogenic to

tomato than the *Antirrhinum* strain, but did not infect potato. The potato isolate was unable to infect any of the test plants. These results show that isolates of the fungus from different sources vary in pathogenicity.

WADE (G. C.). **The control of Botrytis corm rot of the Gladiolus.**—*J. Dep. Agric. Vict.*, xliii, 3, pp. 127–130, 6 figs., 1945.

Corm rot of *Gladiolus* due to *Botrytis* sp. [cf. *R.A.M.*, xx, p. 364] was first recorded in Victoria in 1940, when it was found at Kolorama. It has since been noted on corms from other parts of the Dandenong ranges, the metropolitan area of Melbourne, at Geelong, Ballarat, and on the Mornington Peninsula. It is present in the coastal parts of New South Wales and in Tasmania. Serious losses have been caused, in some cases amounting to over 50 per cent. of the corms of susceptible varieties.

All parts of the plant are attacked. On the corm, the earliest stage consists of a brown discoloration of the core region; later on, the rot spreads along the water-conducting vessels, developing rapidly when it reaches the surface. Severely infected corms may be reduced to a soft, rotten mass. The condition may not be apparent until the scales are removed, though the corm feels very soft when squeezed. If affected corms are kept under moist conditions, the fungus grows on the surface, and develops black sclerotia about $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter, by means of which the disease is carried over from one season to the next. The infected corms later become mummified.

On the leaves, which do not, as a rule, become infected until after flowering time, the fungus produces small, dead areas with a reddish margin; when many spots are present, the whole leaf turns yellow and dies.

Infected flowers bear water-soaked spots, which often coalesce, destroying the whole flower; numerous grey spores are present. Occasionally, collar rot is present, but this aspect of the disease is not important locally, and is usually attributable to planting infected corms. After the corms are dug, the tops cut off, and the corms placed on the drying racks, spores may reach the old corm on the cut stem end. They germinate, and the fungus thus enters the corms through the core.

To secure protection against infection, the corms should be dipped, as soon after digging as possible, and after being thoroughly washed, in mercuric chloride (1 in 1,000) and agral II (1 in 2,000) for 2 minutes, or in hortosan D P (2 oz. per 10 gals.), zetan (synonymous with new improved semesan bel, 1 lb. per 10 gals.), or aretan (4 oz. per 10 gals.) for 15 minutes. Of these hortosan D P and zetan give the best results. Infected corms should be burnt or buried. Unwanted flowers should be destroyed, never left in the field. The disease may also be avoided by early planting; at Kalorama, corms dug before the second week in March are not likely to become infected. The Miss New Zealand, Pelegrina, Red Lory, King Lear, Elinora, Mrs. S. A. Errey, Black Opal, Champlain, Don Bradman, and Rose Dawn varieties are resistant, and the corms of such varieties need not be dipped. Foliage infection is seldom serious enough to require treatment, but may be controlled by spraying at fortnightly intervals, beginning immediately after flowering, with Bordeaux mixture (6–4–40) plus agral II (1 in 2,000).

BREMER (H.) & İŞMEN (H.). **Studien über Fusicladium, die gefaehrlichste Kernobstkrankheit in der Türkei.** [Studies on *Fusicladium*, the most formidable pome fruit disease in Turkey.]—*Zir. Derg.*, v, 57, pp. 10–18, 5 figs., 1944. [Turkish, with German summary.]

Fusicladium scab of pome fruits is widespread in Turkey, where it causes heavy annual losses. The agents of the disease on apple (*Venturia inaequalis*) and pear (*V. pirina*) flourish in the humid atmosphere of river valleys. Loquats sustain severe damage from scab [*F. dendriticum* var. *eriobotryae*: *R.A.M.*, xix, p. 582]

in the south, where their fruits reach the critical stage of maturity during the rainy period prevailing at that time. The disease (*V.* sp.) also occurs on *Sorbus domestica* [*Pyrus sorbus*: ibid., xvi, pp. 230, 518], but only in a mild form.

The course of infection pursues the lines familiar in Europe and North America. The perithecia ripen during the period from February to the beginning of April, but the dependence of this process on an aggregate of mean temperatures from 1st March onwards observed in Central Europe [ibid., xviii, p. 531] could not be confirmed in Turkey. Experiments on the viability of the conidia at varying temperatures and humidities demonstrated the capacity of these organs to survive for at least six months at 15° to 25° C. irrespective of moisture, at 25° to 35° only in dry air. This persistence of the conidia under hot, dry conditions may explain the prevalence of scab in Turkey. Viable conidia were found throughout the summer in scab lesions, whether of the current season or of several years' standing, on pear twigs, indicating that in Turkey, as elsewhere, this is an important source of inoculum.

A dormant application of concentrated Bordeaux mixture is recommended as the starting-point for the apple and pear scab spraying schedule, but the correct dates for the subsequent treatments must be determined by experiments in the different affected localities. Varietal resistance to the disease has so far been observed only in one locality.

ERIKSON (D.). **Certain aspects of resistance of Plum trees to bacterial canker. Part I. Some biochemical characteristics of Pseudomonas mors-prunorum (Wormald) and related phytopathologic bacteria.**—*Ann. appl. Biol.*, xxxii, 1, pp. 44–52, 1945.

In a study of the nutrition of *Pseudomonas mors-prunorum*, with special reference to its degree of specialization in the use of sources of carbon and nitrogen, and an investigation of the relationship of this organism with *P. prunicola* and similar pseudomonads isolated from pear and *Syringa*, all the isolates studied except *Bacterium tumefaciens*, *Bact.* [*Xanthomonas*] *pruni*, and pear strain 8 belonged to the green-fluorescent group of *Pseudomonas* (Dowson's group II) [*R.A.M.*, xviii, p. 658], *X. pruni* and pear strain 8 belonging to group III, and *Bact. tumefaciens* to group I.

Omitting pear strain 8, differentiated by its particulate growth, insoluble yellow pigment, and ability to grow on rhamnose, the evidence showed that all the green fluorescent organisms were very closely related as regards their fundamental carbon and nitrogen requirements, and that these can be obtained from a large variety of simple substances. *P. marginalis*, *P. pisi*, *P. tabaca*, *P.* [*medicaginis* var.] *phaseolicola*, *P. cerasi*, *P. fluorescens*, and *P. pyocyaneus* agreed very closely in their general biochemical characteristics. All grew and, as a rule, produced pigment on the simplest media. *Bact. tumefaciens* has more complex requirements, while *X. pruni* agreed in most respects with the pear strain 8.

This work justifies the inclusion of *P. mors-prunorum*, *P. prunicola*, *P. syringae*, and the other *Syringa* and pear strains tested in the general definition of *Pseudomonas* as heterofermentative bacteria, which, while showing an oxidative dissimilation of the products of protein hydrolysis, are able to use the salts of organic acids, and which are differentiated from the acetic bacteria that share the latter characteristic by their inability to utilize sugars and alcohols well. The organisms tested showed some differentiation in their action on succinic acid, an alkaline reaction accompanied by fluorescence being much more rapidly given by *P. prunicola*, *P. syringae* (from apricot), and the pear strains than by *P. mors-prunorum* and the *Syringa* strains. On the other hand, most of the *P. mors-prunorum* strains utilized tartaric acid, which was generally unavailable to the other bacteria.

Sucrose was the one sugar that afforded some basis of discrimination between

the strains. A striking fact was the inability of these organisms to utilize starch, cellulose, or the other polysaccharides tested, except pectin. The only consistent biochemical differentiation shown by *P. mors-prunorum* (including some *Syringa* strains), as compared with *P. prunicola* (including *P. syringae* from apricot and most of the pear strains), was its more rapid production of acid from sucrose. Both *P. mors-prunorum* and *P. prunicola* produced a levan from sucrose, which caused a raised gummy growth on solid sucrose-containing media. This also applied to *P. pisi*, *P. tabaca*, and *P. medicaginis* var. *phaseolicola*, but not to the weakly pathogenic forms or the saprophytes.

On a basis of biochemical characteristics, apart from host pathogenicity, no justification exists for erecting into specific rank these various levan-forming, green-fluorescent, phytopathogenic pseudomonads.

REID (W. D.). **Bacterial spot of Plum and Peach.**—*N.Z. J. Sci. Tech.*, A, xxvi, 6, pp. 359–366, 5 figs., 1945.

The morphological and cultural characters of *Xanthomonas pruni* are described, and an account is given of its incidence in New Zealand, where it was first recognized in 1929 but only observed to be widespread in 1941, and of its symptomatology on plum and peach (the latter host having hitherto sustained only minor injury on a small scale). The George Wilson, October Purple, and Sultan plum varieties appear to be the most seriously affected: in a preliminary inoculation trial involving 40 varieties, those of English origin were highly resistant. Spraying with Bordeaux mixture 1½–3–50 reduced the incidence of infection in 1943–4 from 27·85 to 7·8 per cent. without important damage to the foliage, which resulted from the same mixture at 3–4–50. The reduction in spotting to 22·37 per cent. effected by the use of zinc sulphate-lime (4–4–50) is considered insufficient to counterbalance the foliar injury arising from this source. Soil dressings with sodium nitrate were ineffectual for the purpose in view, while drastic winter pruning actually increased the amount of infection.

FRESA (R.). **Podredumbre morena de los Durazneros y Ciruelos en el delta del Paraná.** [Brown rot of Peaches and Cherries in the Paraná delta.]—*Rev. argent. Agron.*, xii, 1, pp. 22–25, 1 pl., 1945. [English summary.]

Peaches and cherries in the Paraná delta, Argentina, have sustained heavy damage since 1937 from brown rot, the agent of which was identified, on the basis of its growth characters in culture described by Hewitt and Leach, as *Sclerotinia fructicola* [*R.A.M.*, xviii, p. 533]. In 1937–8 the losses from this source in one fruit-growing section of the delta amounted to 60 per cent. of the crop. The disease occurs in the form of a fruit rot and occasionally as a blossom blight. Inoculation experiments on the flowers and fruits of both hosts resulted in the infection of these organs, but those on the twigs failed to induce canker formation. *S. laxa* was not isolated from the diseased specimens.

MCCLINTOCK (J. A.). **Sanitary control of black knot of Plums and Cherries.**—*Hoosier Hort.*, xxvii, 3, pp. 45–48, 1 fig., 1945.

Neither spraying nor local excisions have proved very effective in the control of plum and cherry black knot (*Plowrightia morbosa*) [*Dibotryon morbosum*], and the writer accordingly recapitulates information already published in *Rep. Mich. Acad. Sci.* 15, pp. 142, 144, 1913, together with more recent observations in Indiana, on the elimination of the pathogen by sanitary methods. A certain amount of local spread during the summer is caused by conidia, but the ascospores, which are discharged from the knots when spring growth is resumed, provide the main source of inoculum. The fungus is capable of continued development in knots excised from the trees and left on the ground, a fact pointing to the

importance of destroying all diseased material, preferably by burning. Young or newly planted trees usually contract infection from conidia produced in adjacent orchards or on wild plums or cherries, but the fungus may also be introduced on nursery stock, and at least one case of this mode of contamination, involving two-year-old plum trees, is on record in Indiana. Black knots are most easily recognized during the dormant period, when they should be cut out to prevent the emergence of the above-mentioned overwintering ascospores. *D. morbosum* penetrates the limbs beyond the region where the knots appear, so that the branches should be cut several inches below the sites of visible infection. Besides the old-fashioned damson plums, the newer choice varieties, such as Stanley, are susceptible to black knot.

ZELLER (S. M.), OWENS (C. E.), & EVANS (A. W.). **Sour-Cherry leaf-spot control in Oregon.**—*Tech. Bull. Ore. agric. Exp. Sta.* 4, 12 pp., 2 figs., 1944.

In presenting the results of three years' experiments in the control of sour cherry leaf spot (*Higginsia* [*Coccomyces*] *hiemalis*) [*R.A.M.*, xxiii, p. 444] in Oregon, the authors emphasize that the critical period for control depends on the weather and not on the stage of development of the blossoms and leaves. 'Shuck-fall', 'petal-fall', and even the 'two weeks later' applications may be required by the particular climatic conditions obtaining in a given year, and it is all-important to secure thorough coverage of the whole area sprayed. Lime-sulphur gives better control than copper sprays in western Oregon and fermate showed promise as a spray for leaf-spot control, giving as good control as lime-sulphur without causing any leaf injury.

MOORE (M. H.). **A note on Medlar cluster-cup rust (Gymnosporangium confusum Plowr.) in Kent in 1943 and 1944.**—*Trans. Brit. mycol. Soc.*, xxviii, 1–2, pp. 13–15, 1 pl., 1945.

In July, 1943, a severe attack of cluster-cup rust (*Gymnosporangium confusum*) [*R.A.M.*, xi, p. 145; xviii, p. 59; xxiii, p. 43] occurred on the leaves and fruit of a medlar tree (*Mespilus germanica*) in Kent growing near two bushes of a variety of the teleutospore host (*Juniperus sabina*). The scattered leaf spots, as seen on the upper surface, were roughly circular, slightly convex, and about 0·5 cm. in diameter. Most of them, brown in the centre, were surrounded by a conspicuous yellow, orange-streaked halo, and many bore spermogonia. The yellowish to pale brown, curved, cylindrical aecidia, up to 4 mm. long, arose from slightly thickened corresponding areas on the lower surface, and were occasionally found on the upper surface. Many affected fruits were found, bearing similar aecidia on swollen areas, mostly on the fruit itself, but sometimes on the calyx. By October, the affected fruits had all dropped. On the leaves, infection did not develop after teleutospore production ceased. In 1944, infection again occurred, but in a much milder form. The spore measurements conformed in general to those of Plowright and Fischer; aecidiospores measured 22 to 26 (average 24)μ in diameter.

An effective means of control would be to remove the *J. sabina* bushes or cut out the hypertrophied shoots before they produce teleutospores. Alternatively, spraying the medlar in spring with Bordeaux mixture (4–6–100) or some other copper fungicide might be tried.

POWERS (W. J.). **Epsom salts and nutrient value of berries.**—*Science*, N.S., ci, 2621, p. 301, 1945.

The first successful experiment in the application of magnesium to Oregon soils was made recently in the treatment of gooseberries [*R.A.M.*, xix, p. 605] on silty clay loam with 30 lb. per acre magnesium sulphate. Cane growth and foliage appearance improved, the yield was higher than recorded by other treatments,

and the net profit was $62.25 an acre [ibid., xxiv, p. 196]. High applications of potash to overcome leaf scorch seems to have made the magnesium already present in the soil less available to plants and reductions in potash applications resulted in a new profit of $10.70 per acre treated. The vitamin C content of gooseberries and raspberries grown on soils treated with magnesium sulphate showed, respectively, increases of 24·4 and 4 per cent.

BRENTZEL (W. E.). **Seed treatment.**—*Circ. N. Dak. agric. Exp. Sta.* 69, 16 pp., 10 figs., 1944.

This circular gives popular notes on seed disinfectants [*R.A.M.*, xxii, p. 472] for cereals, flax, and millet.

Centraalbureau voor Schimmelcultures, Baarn (Nederland). Lijst van Schimmelcultures 1943. [Central Bureau for Fungus Cultures, Baarn (Holland). List of fungus cultures 1943.]—141 pp., 1943. [Received June, 1945.]

In the introduction, contributed by Dr. Johanna Westerdijk, to this list of fungus cultures maintained at the Centraalbureau voor Schimmelcultures, Baarn [cf. *R.A.M.*, xv, p. 38], it is stated that during the period from 1940 to 1942, inclusive, the Bureau's collection was enlarged by 390 species, among the most interesting of the acquisitions being a collection of lignicolous fungi from R. W. Davidson (United States), Blastocladiaeae and Chytridiaceae from R. Harder (Göttingen, Germany), various fungal occupants of seed from P. Neergaard (Copenhagen), and Hymenomycetes from E. Melin (Upsala, Sweden).

MARSH (R. W.). **Presidential address. Mycological contacts.**—*Trans. Brit. mycol. Soc.*, xxviii, 1–2, pp. 1–10, 1945.

In this presidential address to the British Mycological Society, the author cites some examples, mostly from his own experience, of the association of mycology with agricultural research. He emphasizes the value of this association to mycology, and puts forward a plea for similar associations between mycology and the medical and industrial fields. Methods of bringing this end about are briefly discussed in relation to the general problem of the integration of the biological societies.

COTTAM (C.). **Eelgrass conditions along the Atlantic seaboard.**—*Plant Dis. Reptr*, xxix, 12, pp. 302–310, 1945. [Mimeographed.]

This survey records a marked improvement of the eelgrass plant (*Zostera marina*) wasting disease [*R.A.M.*, xxiv, p. 240] along many sections of the American Atlantic coast. Recovery occurred both in bays and coves with reduced salinity, and in almost unmodified sea water; on the other hand, the disease was also active in regions of reduced salinity and in some of the more open bays. No improvement was reported by H. F. Lewis in the eelgrass situation on the north shore of the St. Lawrence or on the coast of Nova Scotia, but some improvement occurred on the Quebec coast. A. E. Addy reported in August, 1944, a rather widespread attack of the disease with characteristic symptoms of *Labyrinthula macrocystis* [loc. cit.] on the Massachusetts coast. Notable improvements were reported by the Long Island Game Protection Association and the United States Game Management Agencies for Long Island and New Jersey.

The author points out that no other plant disease has spread so quickly or with such catastrophic consequences to a plant species. The effect on coastal fishery resources and upon sea brant, geese, and other coastal waterfowl has been most serious; the situation in any local area remains highly variable and unpredictable.

GREGORY (P. H.). **The dispersion of air-borne spores.**—*Trans. Brit. mycol. Soc.*, xxviii, 1–2, pp. 26–72, 6 graphs, 1945.

In this paper the author examines in detail the nature and magnitude of the factors that control the scattering of air plankton, reviews the literature of the subject in order to ascertain whether the observed distributions of plant pathogens follow recognizable patterns, and finally discusses the application of the subject to the study and prevention of air-borne diseases of field crops [*R.A.M.*, xxiii, p. 310].

The conclusions reached may be summarized as follows. The deposition of air plankton, such as passively air-borne pollen grains or fungal spores, decreases with increasing distance from a given source. The terminal velocities of spores depend on their size, and are roughly what may be expected for smooth, spherical particles from Stokes's law, but moderately wide deviations between observed and expected values are probably due to surface roughness and asymmetry. Fungal spores fall at velocities between 0·04 and 2·5 cm. per sec., and pollen grains at velocities between 1·5 and 40 cm. per sec. The mean wind velocity at 10 m. altitude is about 300 cm. per sec. Attempts to calculate the dispersal of spores as the resultant of vertical fall under gravity and horizontal wind movement apply only to non-turbulent air movement, and are inapplicable at more than a few mm. above the earth's surface. Differences in rate of spore fall are probably not major factors in dispersal. It is more appropriate to consider a spore cloud in suspension in the air in process of dilution by eddies in the course of its transport by the wind.

In support of the concept of the spore cloud as a suspension it is shown that at heights in the atmosphere above the surface layers, the concentration of pollen and spores decreases exponentially with increasing height in the manner that would be expected if particles falling under gravity were balanced by other particles diffused upwards by eddies. The values for eddy diffusivity, K, varying from $1{\cdot}5 \times 10^4$ to $3{\cdot}3 \times 10^5$, deduced for spores and pollen, are of the order usually found in meteorological work.

Terminal velocity, while it may play only a small part in spore dispersal, may be more important in causing deposition of spores brought down by eddies to the boundary layer of relatively still air a few cm. thick at the earth's surface.

Based on Sutton's theory of eddy diffusion, equations are given for the deposition of spores at various distances from a point source, while from Stepanoff's data [ibid., xv, p. 383] it is concluded that in travelling across 1 sq. cm. of surface there are deposited the equivalent of the number of spores present in a layer on the axis of the cloud about $\frac{1}{2}$ mm. thick. This value is expressed as a coefficient of deposition, p, and is regarded as a parameter of much biological significance. Observed gradients of air-borne plant infections originating from a point source are shown to be closely predicted by the deposition theory, while splash-dispersed fungi slow gradients incompatible with it. An approximate formula is given for gradients from strip sources, and observed gradients show reasonable agreement.

The significance for plant hygiene of this work is that, while attention should be paid to isolation, most emphasis should be placed on eliminating foci of infection within a crop.

A list of 89 bibliographical references is appended.

CONOVER (R. A.) & STEVENS (N. E.). **A Penicillium 'disease' of ink.**—*Trans. Ill. Acad. Sci.*, xxxv, 2, p. 59, 1942. [Received June, 1945.]

Blemishes in the form of pale reddish-brown spots on soap wrappers were found to be due to the contamination of the ultramarine blue dye used in the printing by a hitherto unidentified species of *Penicillium*.

HEALY (C. P.) & NIVEN (J. C.). **Mould and humidity in radio and signals equipment.**—*Proc. Inst. Radio Engrs, N.Y.*, xxxiii, 5, pp. 300–306, 8 figs., 1944.

This paper is concerned with radio equipment constructed by pre-war methods and used in areas north of Australia, under tropical conditions, where mould growth is severe and this, in addition to the effect of humidity on the components, may render the equipment inoperative shortly after arrival in the fighting zones. The authors then proceed to describe infection and methods for its control in various classes of equipment.

Organic dust is probably the source of mould nutrient on metal surfaces and damages may occur through by-products of mould growth. Electrical insulation suffers damage from saturated mould causing surface leakage: the mycelia of moulds are conductors. Control measures are directed towards the elimination of materials causing mould growth and their replacement by non-affected material, and treating mould-susceptible materials with suitable fungicides.

The growth on cotton-braided, rubber-covered wire which is thinly lacquered is prolific. As the mould holds water in a saturated atmosphere, the surface insulation drops to a few ohms per yard. One per cent. copper naphthenate or trichlorphenol in paraffin, or 1 per cent. salicylanilide in methylated spirits render this wire immune from mould growth on immersion.

Polyvinyl chloride or vulcanized rubber covering without additional braids and, in some cases, polyvinyl chloride covering with a fibreglass braid have proved satisfactory in the protection of connecting wires. Replacement of cotton by plastic sleeving has proved more satisfactory than treating the cotton for the prevention of rot. Latex solution, an adhesive for fixing labels on smooth surfaces and highly susceptible to mould growth, resists growth on the addition of 20 gm. salicylanilide per gal. solution, and thick films of cellulose-nitrate lacquer protect paper labels effectively for as long as twelve months. Paper labels should, however, be avoided if possible, as, apart from obliteration of the printing, the paper is rotted to disintegration by the mould.

Treatment of synthetic resin-bonded paper sheet by high-grade oleo- or alkyd resin varnishes lessens serious loss of insulation resistance in damp tropical areas, without preventing it, and where possible it should be replaced by ceramics, polystyrene, mica, or similar materials. Likewise, fabric-filled phenolics and wood-flour-filled materials may show mould growth more or less and lose insulation resistance in humid conditions, and mica-filled phenolic moulding materials are superior to the latter. Micanol or English xmb262 seem satisfactory, but do not compare with ceramics or polystyrene. Drying and treating with a thin coating of polystyrene lacquer give improved surface protection of unglazed ceramics.

Reports from New Guinea show that leather in any form grows mould and disintegrates in a few weeks. It should where possible be replaced by webbing or some other fabric responsive to treatment.

One per cent. solution copper naphthenate, salicylanilide, or trichlorphenol, the first by weight of copper and the others by weight of compound, prevent mould growth on canvas and duck, though one specimen of birkmyre (English) canvas, treated by the manufacturers, actually resisted mould on test. Cords for cable-tying and aerial guy ropes can be treated similarly.

Copper naphthenate solution prevents mould growth and termite attack on woodwork but does not protect plywood bonded with casein or gelatine glues. Urea-formaldehyde or phenol-resin glues are satisfactory bonding materials, but the wood still requires fungicidal treatment.

Dry batteries suffer when sent to the tropics in untreated cardboard containers. They should be sealed in metal cases filled with a plastic petroleum asphalt. Other

apparatus discussed include power-transformers, paper capacitors, and intermediate-frequency and radio-frequency inductors.

Immunity of varnish or lacquer through fungicidal treatment does not necessarily protect the base material where this provides nutrient for mould growth. 'Fungiciding' the base-material has proved a superior method of preventing mould growth to incorporating fungicides in paints, varnishes, and lacquers. Casualties to electrical equipment usually occur during storage and transport and it is important that the wood in packing-cases should be treated with copper naphthenate against termite and mould attack.

As a general rule, it is better to use material such as the vinyl plastics, mica, ceramics, and like products, which are unaffected by mould and humidity, than other materials, which prove unsatisfactory even when treated.

It is recommended that equipment supplied to tropical areas should be hermetically sealed in containers.

The resistance of materials and components to mould and humidity is determined in two test atmospheres: subjection to 70° for eight hours, cooling to ambient over 16 hours, then transfer to a chamber maintained at 60°±2° and 95 per cent.±5 per cent. relative humidity for six hours. The closed chamber is cooled over a period of 16 hours. The above cycle is repeated once. A static humidity test has also been developed in which the test chamber is maintained at a temperature of 86°±2° and a relative humidity of 95 to 100 per cent. with condensation predominating. This chamber is used both for static humidity and mould-testing. Before exposure in the static-humidity atmosphere, materials and components are sprayed by means of an atomizer with a suspension of mixed spores of the following species: *Aspergillus glaucus*, *A. niger*, *Penicillium luteum*, *P.* No. 40, *Memnoniella echinata*, and *Rhizopus nigricans* [*R. stolonifer*].

BAYLEY (C. H.) & WEATHERBURN (M. W.). **Rotproofing cotton fabrics.**—*Canad. Text. J.*, lxii, 5, pp. 34, 36, 46, 1945.

A tabulated account is given of an investigation conducted at the National Research Laboratories, Ottawa, on the copper naphthenate [see preceding abstract] tolerance of the cellulose-destroying fungi, *Chaetomium globosum*, *Metarrhizium glutinosum*, and *Aspergillus niger*, and on the effect of mercuric naphthenate on *A. niger* and a *Penicillium* isolated from orange-coloured areas on copper-treated cotton fabrics subjected to the standard soil burial test [*R.A.M.*, xxiv, p. 331]. The culture medium and method of inoculation were those prescribed by Thom *et al.* (*Amer. Dyest. Reptr*, xxiii, p. 581, 1934). The trial samples, consisting of pieces of light cotton sheeting 1 in. sq., were immersed in copper naphthenate solutions at concentrations ranging from 0·005 to 0·8 per cent. and incubated at 30° C.

All the organisms were capable of growth at the lower copper dosages. *C. globosum* was partially and totally inhibited at 0·1 and 0·3 per cent., respectively, and *M. glutinosum* at 0·07 and 0·5, respectively, whereas *A. niger* continued to develop freely at 0·8.

Another series of experiments was carried out to determine the effects of leaching, artificial weathering, waterproofing wax, and 25 per cent. mercury-containing mercuric naphthenate on the growth of *A. niger* and the above-mentioned species of *Penicillium* on a copper naphthenate-treated No. 8 cotton duck fabric.

Both organisms grew readily on the copper naphthenate-treated samples even in the presence of wax, whereas the development of *A. niger* was brought to an almost total standstill by 0·03 per cent. mercuric naphthenate and completely inhibited at 0·1, the latter concentration also entirely arresting the growth of the more resistant *Penicillium*. Considerable loss in breaking strength was registered in the untreated and leached (for 24 hours) and weathered (400 hours in a

weatherometer), copper naphthenate-treated samples attacked by the *Penicillium*, which was not repelled by the inclusion of waterproofing wax (a mixture of paraffin wax and No. 2 petrolatum grease, 3 : 1) in the solution, but the addition of increasing amounts of mercuric naphthenate obviated this defect to some extent.

SNOW (D.). **Mould deterioration of feeding stuffs in relation to humidity of storage. Part III. The isolation of mould species from feeding stuffs stored at different humidities.**—*Ann. appl. Biol.*, xxxii, 1, pp. 40–44, 1945.

In this further account of studies on the mould deterioration of feeding stuffs [*R.A.M.*, xxiii, p. 397] stored at different humidities, the author states that the moulds most likely to occur in commercial storage are those able to develop at humidities of 85 per cent. or less. *Penicillium* species were unable to grow below 75 per cent. R.H., and flourished only at or above 85 per cent. R.H., whereas *Aspergillus* species developed in a very restricted moisture supply. *A. echinulatus*, *A. repens*, and *A. ruber* developed at humidities of 70 per cent. and under; *A. chevalieri* and *A. amstelodami* at 80 per cent. and over; *A. candidus*, 70 per cent. and over; *A. penicilloides*, 75 per cent. and over; *A. versicolor* and *A. sydowi*, 85 per cent.; and *A. niger*, 90 to 100 per cent.

At humidities under 80 per cent. the limited number of species able to develop often required long latent periods before spore germination could occur. At humidities over 80 per cent. a succession of species developed on many samples. At 100 per cent. R.H., for instance, members of the Mucorales established themselves in two or three days and were the dominant mould present. After a week, however, members of the *A. glaucus* group and *Penicillium* species grew rapidly on these samples, and became the dominant moulds at the expense of the Mucorales. *A. niger* did not appear until nearly two weeks had elapsed, while the slower-growing forms, such as *A. candidus*, did not develop until after three weeks. Some members of the Fungi Imperfecti, e.g., *Sporotrichum* sp., were not evident early in storage, but later provided the dominant moulds on many of the samples stored at high humidities. Species well adapted to growing on feeding stuffs, such as members of the *A. glaucus* group and, at 85 to 100 per cent. R.H., *Penicillium* spp., developed at the expense of species less well adapted.

Infection may, conceivably, occur in the field, during processing, or during transit or storage of the raw material or the processed feeding stuff. Some of the fungi isolated could, probably, have been traced to the country of origin of the original plant constituents of the feeding stuffs, particularly in the case of imported oil-seed cakes manufactured in tropical or sub-tropical countries; *A. chevalieri* is a common contaminant of foodstuffs from such parts. Feeding stuffs manufactured in Great Britain from imported materials are partially sterilized by the heat treatment received during processing, but mould contamination readily takes place afterwards from the machinery, workers' clothing, sacks, and the air in the storage rooms.

The range of feeding stuffs from which *Aspergillus* spp. and *Penicillium* spp. were isolated was as follows. *A. repens* was obtained (at 67 to 100 per cent. R.H.) from bone meal, bran, dried grass, groundnut cake, linseed cake, locust beans [*Ceratonia siliqua*], oats, and Scotch beans; *A. ruber* (at 70 to 100 per cent.) from bran, groundnut cake, linseed cake, locust beans, and Scotch beans; *A. chevalieri* and *A. amstelodami* (at 80 to 100 per cent.) and *A. echinulatus* (at 65 per cent.) from linseed cake. Of species outside the *A. glaucus* group, *A. candidus* was isolated (at 70 to 100 per cent.) from bran, linseed cake, locust beans, and oats, *A. penicilloides* series (at 75 to 100 per cent.) from bone meal and oats, *A. versicolor* (at 85 to 100 per cent.) from linseed cake and oats, and *A. sydowi* (at 85 to 100 per cent.) and *A. niger* series (at 90 to 100 per cent.) from linseed cake.

Paecilomyces varioti was obtained from palm-kernel cake stored at 70, 85, 95,

and 100 per cent. R.H., *Penicillium spinulosum* from linseed cake, oats, and palm-kernel cake at 75 to 100 per cent., *P. luteum* series from palm-kernel cake at 90 to 100 per cent., *P. cyclopium* from linseed cake and palm-kernel cake at 90 to 100 per cent., and *P. rugulosum* from palm-kernel cake at 100 per cent.

The frequent occurrence of the small-ascospored species of the *A. glaucus* group particularly *A. repens* and *A. ruber* on such a wide variety of feeding stuffs, at humidities of 67 to 100 per cent., indicates that these species are those best adapted for growth on materials in which the moisture supply is limited. Mould damage to feeding stuffs in commercial stores is probably mainly due to these forms, but under conditions of prolonged high humidity (over 85 per cent.), other species of *Aspergillus* (e.g., *A. sydowi* and *A. versicolor*), and of *Penicillium* and other moulds can become established.

DEMEREC (M.). **Genetic aspects of changes in Staphylococcus aureus producing strains resistant to various concentrations of penicillin.**—*Ann. Mo. bot. Gdn*, xxxii, 2, pp. 131–138, 3 figs., 1945.

In experiments with *Staphylococcus aureus*, strains resistant to penicillin were developed which retained that property after 20 transfers in broth. Experimental evidence indicates that resistance is not induced by the action of the penicillin, but originates as a change comparable to mutation. In any large population of bacteria there are some individuals resistant to certain low concentrations of penicillin. If this population is exposed to the action of such concentrations of penicillin, non-resistant individuals are eliminated while the resistant survive.

THAYSEN (A. C.). **Food yeast: its nutritive value and its production from Empire sources.**—*J.R. Soc. Arts*, xciii, 4693, pp. 353–361, 3 figs., 1 graph, 1945.

In this paper, read before the Royal Society of Arts on 20th March, 1945, the author discusses the dietetic value of yeast, deals in some detail with food yeast production [*R.A.M.*, xxiii, pp. 399, 494], and gives a succinct account of the manufacturing plant which, it is hoped, will soon be in full production in Jamaica. The paper is followed (pp. 361–364) by a discussion.

MEYER (J. R.). **Método para proteção das Orquídeas quando retiradas dos recipientes de cultura para adatação ao meio exterior.** [Method for the protection of Orchids on withdrawal from culture vessels for adaptation to the external medium.]—*Biológico*, xi, 2, pp. 48–51, 2 figs., 1945.

Full directions are given for the protection from insect contaminants of orchid seedlings during the transition period between their withdrawal from the asymbiotic medium recommended for the initial growth phase [*R.A.M.*, xxiv, p. 200] and transference to their permanent quarters. The interval of four to six months should be spent packed in tubes containing soft, damp 'xaxim', with cotton wool or gauze stoppers, kept in a well-lighted room at a temperature ranging from 20° to 37° C.

VASILKOV (B. P.). К систематике осиновика **Boletus versipellis Fr.** [The systematic position of *Boletus versipellis* Fr.]—Советск. Бот. [*Sovetsk. Bot.*], 1944, 2, pp. 21–27, 1944.

The author considers the mycorrhizal fungi *Boletus aurantiacus*, *B. rufescens*, *B. ericetorum*, and *B. arcticus* [*R.A.M.*, xx, p. 547], commonly found in Russia, to be forms of *B. versipellis*, whilst another fungus found in a plantation of birch and pine, with aspen undergrowth, was similar to, but distinct from *B. versipellis*, and is described as *B.* (*Krombholzia*) *percandidus* n. sp. At first glance it might be taken for an albino form of *B. versipellis*, but the black-brown discoloration

on compression of the pileus and stipe, the yellow-white pores, and the thick, large, rough scales on the stipe are foreign to that species.

BISBY (G. R.). **Longevity of Schizophyllum commune.**—*Nature, Lond.*, clv, 3946, pp. 732–733, 1945.

On 5th March, 1945, the writer opened a tube containing five parts of pilei of *Schizophyllum commune* collected at Winnipeg, Canada, by the late Professor A. H. R. Buller in October, 1909, and kept since December, 1910, in a vacuum in the dark at room temperature. When placed in a damp chamber, all the parts expanded but only one shed spores, which it did continuously until its removal after three days. Some of the asymmetrical spores, measuring 6 to 7·5 by 2μ (the normal dimensions for the species), germinated in water. Gill sections of this fan-shaped piece of pileus showed normal basidia, sterigmata, and spores in various stages of development. A whole pileus from another tube opened on 8th March was placed on agar and rapidly started to produce spores, practically all of which germinated. Pure cultures were thus readily obtained, the hyphae of which developed clamp-connexions. Transferred after two days to a damp chamber, the pileus proceeded to form spores until 31st March. Meanwhile, rudiments of new pilei were formed near the margin, one of which expanded to 10 by 6 mm. and shed spores from 23rd March until 2nd April.

A tube containing two pieces of pilei of *S. commune*, also collected in 1909, which had been sealed in a very high vacuum on 5th June, 1912, was opened on 1st March, 1945; one piece sporulated normally when moistened. Similar results were obtained with a portion of a pileus from one of the 1910 vacuum tubes that had been immersed in liquid air (—190° C.) for three weeks in 1912 and was opened on 8th March, 1945.

Each of the four tubes opened contained a specimen still living 35½ years after it had developed, of which 34¼, or in one instance 32¾, were spent *in vacuo*. Eleven of the vacuum tubes await further investigation.

PANASSENKO (V. T.). Экология плесневых грибов. [Ecology of the moulds.]—Микробиология [*Microbiology*], xiii, 4, pp. 159–170, 1944.

In this ecologic study on moulds, which are defined as an ecologic group containing members of various systematic groups, the author surveys the various factors affecting growth, of which temperature and relative humidity are the most important. Moulds developing below 0° C. are classified as cold-tolerant, those growing from 5° to 30° (with an optimum of 20° to 25°) as intermediate, and those growing between 40° and 50° as heat-tolerant.

The range of humidity at which fungi develop is more limited than that of temperature, and moulds are hygrotolerant when they develop in 90 to 100 per cent. relative humidity, intermediate in 80 to 90 per cent., and xerotolerant in 65 to 80 per cent. Other factors include P_H range, presence or absence of oxygen (which is usually essential for growth), and concentration of the medium. *Oospora halophila*, for example, is cited as developing in a 50 per cent. solution of common salt, and *Penicillium cupricum* as tolerating 9·5 per cent. copper sulphate. Elements like copper, iron, and zinc may set up great changes. Examples of the effect of all these factors are given.

RICE (MABEL A.). **The cytology of host-parasite relations. II.**—*Bot. Rev.* xi, 5, pp. 288–298, 1945.

In continuation of her earlier paper [*R.A.M.*, xv, p. 108] the author reviews and discusses studies by numerous workers during the past ten years upon the physiology of parasitism with special reference to rusts. A bibliography of 37 titles is appended.

VAN DER PLANK (J. E.) & WASSERMAN (J. W.). **Mass production of virus-free Potatoes.**—*Nature, Lond.*, clv, 3948, pp. 794–795, 1945.

Under the powers given by the Agricultural Pests Act, 1911, a reserve comprising the Riet River Settlement and all land within ten miles of it has been set aside in South Africa for growing virus-free potatoes [cf. *R.A.M.*, xxiv, p. 162], the aim being to produce 5,000 tons virus-free seed per annum.

RAEDER (J. M.). **Diseases of Potatoes in Idaho.**—*Bull. Idaho agric. Exp. Sta.* 254, 39 pp., 19 figs., 1944.

Popular notes are given on a number of well-known parasitic and non-parasitic diseases of potatoes in Idaho, with directions for their control and a special section on seed treatment.

FOISTER (C. E.), WILSON (A. R.), & BOYD (A. E. W.). **Potato dry rot and gangrene as soil-borne diseases.**—*Nature, Lond.*, clv, 3948, pp. 793–794, 1945.

Experiments conducted in Scotland in 1943, in which random samples of soil were taken from 20 fields and Doon Star potatoes inoculated with small quantities of each, showed that *Fusarium caeruleum* [*R.A.M.*, xxiii, pp. 453, 497] may be present in soil at least two years after the last potato crop. Marked variations in the degree of infestation of the soil samples were detected. Other evidence demonstrated that *Phoma foveata* [ibid., xx, p. 91] is soil-borne.

CASSELL (R. C.). **Fusarium rots and storage diseases of Potatoes in New York.**—*Plant Dis. Reptr*, xxix, 13, pp. 337–342, 1945. [Mimeographed.]

The author presents the results of an examination of 356,500 bush. potatoes in 58 lots of 30 to 42,000 bush. from six counties of New York State in March, 1945.

Fusarium rots were found in 34 of the 58 lots, average prevalence being 5 per cent. with maximum 17, attributed tentatively to *F. sambucinum* and several rots presumed to be caused by *Fusarium* but not otherwise identified. *F. sambucinum* was by far the most common in all six counties, being present in 27 of the 34 bins, the Chippewa, Sequoia, and Sebago varieties proving to be the most susceptible. *F. sambucinum* seems to cause disintegration of the tissue, leaving a dry cast as the rot progresses into the flesh of the tuber. As a result the skin tends to form a shrivelled but fairly firm cover over a dry cast of disintegrated flesh of depth varying with the activity and progress of the fungus, and extending over a small to large area. In some cases surface disintegration may almost keep pace with interior collapse and in others the interior disintegration may proceed faster, forming a shallow, dry pit concealed by the firm, dry cast covered by the partially shrivelled skin. Surface and fleshy tissues change from black to deep brown with age, and infection is apparently possible wherever a wound occurs. In this survey the average percentages of *F. sambucinum* rot observed in the varieties Sebago, Pontiac, Katahdin, Chippewa, and Rural were 10·7, 7·0, 1·2, 1·0, and 0·36, respectively, for all bins examined.

STONE (G. M.) & WILSON (C.). **Late blight of Potatoes in Baldwin County, Alabama, in 1945.**—*Plant Dis. Reptr*, xxix, 15, pp. 378–381, 1 map, 1945. [Mimeographed.]

There is no authentic record of potato blight (*Phytophthora infestans*) in Baldwin County, Alabama, before 1940, when a trace of the disease was found. Prevalence, however, gradually increased, and in 1944 more than 60 per cent. of the crop was destroyed. Field observations indicated that blighted seed potatoes were the source of almost all the infection, wind-borne inoculum, apparently,

having played only a minor part. In fields where much disease developed, the focal point of infection could usually be found, from which infection diminished rapidly in all directions.

WAGER (V. A.). **Early blight in Potatoes.**—*Fmg S. Afr.*, xx, pp. 318–320, 2 figs., 1945.

The author describes the characteristics distinguishing potato early blight (*Alternaria solani*) [*R.A.M.*, xxii, p. 223] from late blight (*Phytophthora infestans*) and from the virus disease kromnek [tomato spotted wilt virus: ibid., xxii, p. 396], which infects occasional plants, whereas early blight usually infects the whole crop. Early blight spreads rapidly in dry weather, particularly if there are heavy dews. Successive early morning spraying with Bordeaux mixture or dusting with copper-lime dust often enough to keep the new leaves covered is recommended. Hand-working dusting machines are once again obtainable in South Africa and copper-lime dust is plentiful, 20 to 30 lb. an acre being required. Success largely depends on frequent dustings.

JOSEFSSON (A.). **Rostfläcksjuka hos Potatis.** [Rust spot disease of Potatoes.]—*Sver. Utsädesfören. Tidskr.*, lv, 1, pp. 34–42, 1 fig., 1945. [English summary.]

The symptoms of a disease affecting certain potato varieties, notably Alpha, Ackersegen, Dir. Johannsen, and Erdgold, on alkaline (P_H7) sandy soils in the south of Sweden appear to agree with those of internal rust spot (or spraing as described by Chupp from the United States [cf. *R.A.M.*, iv, p. 560]). The examination of tubers of the two first-named varieties, cut from end to end into eight sections of uniform thickness, revealed a marked decrease in the percentage of discoloured tissue towards the crown end, while in cases of severe attack the navel end is less affected than the centre. For instance, the percentage of discoloration in eight consecutive sections of Ackersegen, reckoning from the navel end, were 70, 90, 90, 70, 53, 37, 23, and 13, respectively, the corresponding figures for Alpha being 72, 91, 81, 72, 50, 47, 41, and 25, respectively.

A rough test was carried out to check the possible connexion between the disease and manganese deficiency, in which manganese peroxide was incorporated into the soil at the rate of 30 kg. per ha. before planting the Alpha tubers, while another section of the plot also received an additional 50 kg. of the compound in the form of a spray solution during early growth. The double treatment resulted in complete freedom from the disorder, 16 per cent. of which developed both in the untreated section and in that given the pre-planting application only.

FORD (C. E.). **Experiments on the control of bark rot.**—*Quart. Circ. Ceylon Rubb. Res. Scheme*, xxi, 1–4, pp. 29–34, 1944.

The author describes a number of experiments in connexion with tapping canker, a disease of the renewing bark of *Hevea* rubber in Ceylon, which became serious in 1943, and is different from the usual bark rot (*Phytophthora palmivora*). Out of 172 clones 40 were found to be affected. The first symptoms observed were small, roughly circular, depressed patches on the renewing bark, from $\frac{1}{2}$ to 1 in. above the tapping cut. The surface was black and often peppered with a white mycelium; the tissue was devoid of latex, waterlogged, and yellowish-brown. In some trees the infection spread into healthy bark below the tapping bark, usually through a vertical crack, and sometimes into virgin bark above. At least one instance was noted, however, of spread from a primary infection on virgin bark downwards into the renewing bark. A secondary effect is the appearance of vertical cracks in the renewing bark at the site of naturally healed diseased patches, accompanied by bleeding and the development of pads of coagulated latex at the level of the cambium. A *Phytophthora* sp. was isolated

from diseased bark of an MK3/2 tree, but has not yet been identified and inoculation experiments were inconclusive.

In Ceylon both black stripe and canker of the bark have been attributed to *P. palmivora*. The marked difference, however, between the symptoms of black stripe and those of tapping canker strongly suggest that different physiologic races may be involved.

The results of experiments with five unspecified disinfectants showed that all these combinations effectively controlled both tapping canker and black stripe. Tapping canker can, however, only be remedied by disinfectant treatment in the early stages and patches exceeding $\frac{1}{2}$ in. in diameter must be treated by scraping.

FRICKE (E. F.). **Molybdenum deficiency in the north-east.**—*Tasm. J. Agric.*, xvi, 1, pp. 2–4, 2 pl., 1945.

The author discusses the results of 30 pasture trials in 1944 designed to test the efficacy of molybdenum [*R.A.M.*, xxiv, pp. 316, 337] as a means of soil renovation and improving colour and productivity in clover. The treatments, including two with 12·3 lb. ground molybdenite ore (containing 1 lb. molybdenum) per acre allied, respectively, with 1 cwt. superphosphate and 1 ton lime, and with 1 cwt. superphosphate alone, were replicated five times. The results showed that whether lime was present or not, and allowing for the increase due to superphosphate if present, molybdenum gave an increase in yield of green herbage of 60 to 70 per cent.

STEVENSON (E. C.). **Alternaria ricini (Yoshii) Hansford, the cause of a serious disease of the Castor-Bean plant (Ricinus communis L.) in the United States.**—*Phytopathology*, xxxv, 4, pp. 249–256, 4 figs., 1945.

The designation of the agent of the castor bean (*Ricinus communis*) leaf spot under discussion was changed by Hansford [*R.A.M.*, xxiii, p. 409] from *Macrosporium ricini* Yoshii [ibid., xxiii, p. 358] to *Alternaria ricini*. During the second world war, the demand for this important commodity increased, and in connexion with a project for domestic production to counteract the curtailment of imports, varietal tests were undertaken which revealed serious damage to the seedlings, leaves, and inflorescences. Two types of symptoms may be observed on the capsules, one involving sudden wilt, purple or dark brown discoloration, pedicel collapse, paucity of seeds, and failure of normal dehiscence, and the other characterized by a unilateral sunken area which gradually enlarges to cover the whole pod. In heavily infected plots all the young racemes and even flower primordia are killed. Following very humid periods the diseased inflorescences acquire a black, sooty appearance from the extensive spore deposits on the surface. At the first harvest at the Plant Industry Station, Beltsville, Maryland, on 6th September, 1943, the conidia rose in clouds of dust from the capsules, blackening the workers' hands. Of a total of 3,603 plants covering an area of some five-sixths of an acre 70 per cent. were estimated to be more or less affected on the 15th. Some leaf-spotting and premature defoliation occurred throughout the season, and an intensification of these symptoms coincided with the spread of raceme infection. By the end of August, 1943, the defoliation of some selections was almost complete.

Apart from its slightly longer conidia (47 to 96, mean 70 μ, exclusive of the beak, which measures 51 to 200, mean 112 μ), the species under observation conforms closely to *A. ricini*, as described by Yoshii, but disagrees in various features with other related fungi on the same host.

Inoculation experiments on the capsules were successful only through wounds. Foliar infection was obtained by atomizing seedlings in moist chambers or under bell jars with aqueous spore suspensions. When seed from infected capsules of the Conner and Doughty 11 varieties was planted in sterilized soil in the green-

house, 72 per cent. of the seedlings arising from the former and 17 per cent. of those from the latter developed the typical symptoms. Isolates of the fungus were obtained from 32 out of 34 samples of *R. communis* seed from the 1942 crop in 34 different localities, while in 1943 the conidia were borne in profusion on the surface of capsules from Texas, Louisiana, Mississippi, Georgia, South Carolina, Tennessee, Kentucky, and Arkansas. So far no scheme of control has been developed, but there are indications that seed treatment may be of value in combating the initial phase of the blight.

PINKUS (R.). **El injerto de la Chinchona. (Continúa.)** [*Cinchona* grafting. (Continuation.)]—*Rev. agric., Guatemala*, xxii, 1, pp. 135–140, 4 figs., 1945.

The following item of phytopathological interest occurs in this description of *Cinchona*-grafting methods in Guatemala. A. S. Müller has identified as a species of *Phytophthora* a fungus responsible for the destruction of 3·75 per cent. nursery grafts in 1943 and of apparently comparable prevalence in 1944. Starting as a small, coffee-coloured spot, infection spreads over the leaf until it reaches the midrib, whence it proceeds downwards to the main stem and ultimately kills the graft. Hitherto control has been effected by bi-weekly inspections of the plantations during the rainy season and weekly ones in dry weather, when diseased foliage is removed and burnt. Marked variations in the reaction of individual clones to the pathogen have been observed, and it has further been noted that nurseries exposed to the morning sun and situated on good soil sustain less damage from this source than those deprived of these advantages.

UNAMUNO (L. M.). **Contribución al estudio de los hongos microscópicos de la provincia de Cuenca.** [Contribution to the study of the microscopic fungi of the province of Cuenca.]—*An. Jard. bot. Madr.*, ii, pp. 7–86, 19 figs., 1942. [Received June, 1945.]

The 152 species of fungi herein listed with critical annotations were collected in July, 1932, in the province of Cuenca, where very little mycological exploration has been carried out. The species include 19 new to science and 23 new to the Spanish mycoflora. Among those of special interest may be mentioned *Melampsora lini* on *Linum catharticum*, *Coniothyrium fuckelii* on barberry, *Crumenula laricionis* n.sp. on *Pinus laricio*, *Ascochyta graminicola* on *Phleum pratense*, *Marssonia* [*Marssonina*] *juglandis* [*Gnomonia leptostyla*] on walnut [*R.A.M.*, xi, p. 79], in association with *Microstroma juglandis*, *Ramularia cynarae* on artichoke, and *Hadrotrichum populi* [ibid., xxii, p. 180] in the company of *Septoria populi* on poplar (*Populus pyramidalis*).

The presence of *Aecidium berberidis* [*Puccinia graminis*] on barberries, taken in conjunction with the extraordinary number of Gramineae attacked by this rust, suggests that Cuenca may constitute a centre of dispersal for wheat black rust.

C. laricionis is characterized by cylindrical to clavate asci, 90 to 95·4 by 10 to 12 μ, furnished with a short, bifurcate pedicel; numerous filiform, simple, continuous paraphyses, exceeding the asci in height; and fusoid, continuous ascospores (eight per ascus), acuminate at both ends, 17 to 19 by 3·6 to 4·6 μ, bi- to quadriguttulate, and provided with a membrane 1·5 to 1·8 μ in thickness.

LOSA ESPAÑA (D. M.). **Aportación al estudio de la flora micológica española.** [Contribution to the study of the Spanish mycological flora.]—*An. Jard. bot. Madr.*, ii, pp. 87–142, 8 figs., 1942. [Received June, 1945.]

The following records occur in this list. *Aecidium berberidis* [*Puccinia graminis*] on barberry [see preceding abstract] in the province of León, *P. maydis* on maize

in the environs of Santiago and in Mirando de Ebro, *P. porri* on onion (Mirando de Ebro, 1939), *Bremia lactucae* on *Lactuca virosa* in León, and *Plasmopara nivea* on parsnip in Miranda de Ebro.

JORDÁN DE URRÍES Y AZARA (M.). **Hongos microscópicos de Navarra.** [Microscopic fungi of Navarre.]—*An. Jard. bot. Madr.*, ii, pp. 143–171, 6 figs., 1942. [Received June, 1945.]

This first list of 100 fungi of Navarre includes *Macrophoma oleae* on olive and *Polythrincium* [*Cymadothea*] *trifolii* on clover (*Trifolium repens*).

MÜLLER (A. S.) & CHUPP (C.). **Las Cercospora de Venezuela.** [The Cercosporae of Venezuela.]—*Bol. Soc. venez. Cien. nat.*, viii, 52, pp. 35–59, 1942. [Received June, 1945.]

Comprised in this annotated list of the 176 species of *Cercospora* hitherto recognized in Venezuela [cf. *R.A.M.*, xvi, p. 343] are 29 new to science, including *C. fagopyri* on buckwheat and *C. fuchsiae* on *Fuchsia*, while among others of economic interest may be mentioned *C. apii* on celery, *C. asparagi* on asparagus, *C. beticola* on beet and spinach, *C. brunkii* on *Pelargonium zonale*, *C. cajani* on pigeon pea, *C. canavaliae* on *Canavalia ensiformis*, *C. canescens* on *Vigna unguiculata*, *Phaseolus mungo*, and *P. lunatus*, *C. capsici* on chilli, *C. caribaea* and *C. henningsii* on cassava, *C. citrullina* on watermelon, *C. columnaris* on bean and *P. lunatus*, *C. cruciferarum* on radish, *C. cruenta* on cowpea, *C. helianthi* on sunflower, *C. hibisci* and *C. malayensis* on *Hibiscus esculentus*, *C. kopkei* on sugar-cane, *C. lactucae* on lettuce, *C. mali* on apple, *C. mangiferae* on mango, *C. medicaginis* on lucerne, *C. musae* [*Mycosphaerella musicola*] on banana and plantain [ibid., xxi, p. 351], *C. personata* on groundnut, *C. purpurea* on avocado, *C. ricinella* on *Ricinus communis*, *C. sesami* on sesame, *C. solanicola* on potato, *C. sorghi* on *Holcus sorghum*, *C. viciae* and *C. zonata* on broad bean, *C. violae* on *Viola odorata*, *C. viticola* on vine (*Vitis labrusca*), *C. zeae-maydis* on maize, and *C. zinniae* on *Zinnia*.

C. fagopyri forms on buckwheat foliage circular, grey-green to brown, faintly zonate spots, 1 to 10 mm. in diameter, and is characterized by hyaline, acicular, straight or slightly curved, indistinctly multiseptate conidia, truncate at the base and tapering at the apex, 50 to 150 by 2 to 4 or up to 350 by 5 μ, borne on single or fasciculate, dark brown, multiseptate, up to 5-geniculate conidiophores, 40 to 150 or up to 300 by 4 to 6 μ.

The spots produced by *C. fuchsiae* on *Fuchsia* leaves are circular or angular, pale to dark brown, developing as they age concentric zones and a narrow, dark margin. The conidiophores of this species are fuliginous, distinctly multiseptate, simple, uni- or rarely bigeniculate, straight or slightly curved, 30 to 130 by 4 to 5·5 μ, and the conidia hyaline, acicular or obclavate, straight or slightly curved, indistinctly multiseptate, truncate at the base, subacute at the apex, 20 to 75 by 2 to 3·5 μ.

COUCH (J. N.). **Observations on the genus Catenaria.**—*Mycologia*, xxxvii, 2, pp. 163–193, 78 figs., 1945.

The author describes the life-history and cultural investigations of a fungus, *Catenaria allomycis* n.sp., which was isolated from the soil with its host *Allomyces anomalus*. The thallus of this fungus is similar to that of *C. anguillulae* [*R.A.M.*, vii, p. 375] and it has resting bodies that germinate as in *Blastocladiella cystogena*. Experiments indicate that it is an obligate parasite on species of *Allomyces* and *B. simplex*. On the basis of zoospore structure, methods of discharge, and swimming and resting body structure and germination, the genus *Catenaria* is transferred from the Chytridiales to the Blastocladiales, and Sparrow's subfamily Catenarioideae is raised to family rank as Catenariaceae [cf. ibid., xxiv, p. 250].

SPRINGER (MARTHA E.). **Two new species of Monoblepharella.**—*Mycologia*, xxxvii, 2, pp. 205–216, 51 figs., 1945.

The author records two new species of *Monoblepharella* recovered from soil samples, namely, *M. elongata* from Mexico and *M. laruei* from Nicaragua.

BISBY (G. R.). **Stachybotrys and Memnoniella.**—*Trans. Brit. mycol. Soc.*, xxviii, 1–2, pp. 11–12, 1945.

Since the publication of his paper on *Stachybotrys* [*R.A.M.*, xxiii, p. 151], the author has received numerous cultures and collections, which show that *S. atra* is common in warmer areas and in the south temperate zone. Most of the cultures resembled the standard English culture described by the author. No evidence was found of geographic variation in *S. atra*. A specimen of *S. atra* from Iowa showed a septum at the base of each phialide; the phialides of *S. atra* seem to differ from the usual ones only in shape.

The type collections of Hansford's three new species of *Stachybotrys* [*Proc. Linn. Soc. Lond.*, *1942–3*, 1, pp. 34–67, 1943] were also examined. *S. kampalensis*, with conidia 10 to 14 by 6 to 8 μ, falls within the present author's conception of *S. atra*, which includes conidia of this size. *S. nephrospora*, with somewhat curved conidia, may prove to be a distinct variety of *S. atra*. In *S. theobromae* the conidia are given by Hansford as 20 to 28 by 15 to 18 μ on phialides 21 to 28 by 7 to 10 μ. As Hansford states, no more than three phialides are evident. In the dried material mounted in water the author saw no spore longer than about 24 μ, while many measured 17 to 20 by 15 to 17 μ. This collection is the second to be made of a large-spored *Stachybotrys*. The first was *S. crassa*, described fifty years ago in Belgium by Marchal, with 5 to 7 phialides, 17 to 21 by 10 to 12·5 μ, and globose spores, 16 to 18 μ. If this species shows variability comparable with that of two other species of *Stachybotrys*, then *S. crassa* and *S. theobromae* may prove to be the same species.

Cultures and data from Dr. Lilian Fraser of Sydney and R. M. Brien of Auckland show that *Memnoniella echinata* (Riv.) Galloway is common, especially on old cloth in warmer areas. It regularly produces persistent chains of conidia without slime. The cultures agreed with Galloway's description and culture, and the fungus is distinct from *S. subsimplex*.

STRONG (M[IRIAM] C.). **Tomato diseases in Michigan.**—*Circ. Mich. agric. Exp. Sta.* 139, 47 pp., 24 figs., 1945.

Notes are given in this bulletin in semi-popular terms on the symptoms, causes, and control of the chief tomato diseases found in Michigan. A special section is devoted to the control of tomato diseases in general.

WALSH (T.) & CLARKE (E. J.). **A chlorosis of Tomatoes in relation to potassium and magnesium nutrition.**—*J.R. hort. Soc.*, lxx, 7, pp. 202–207, 1945.

A chlorosis of tomatoes [*R.A.M.*, xxiii, p. 502], extending upwards from the fourth or fifth leaf from the bottom of the plant until sometimes all except the top leaves are affected, has become familiar in recent years to growers in Eire and is also apparently widely distributed in Great Britain. The disorder was shown by leaf analyses to be caused by magnesium deficiency brought about by high potassium dressings. This condition can be controlled by the liberal use of magnesium sulphate, which, however, leads to a salt concentration likely to favour the development of blossom-end rot and, by injuring the cortex of the roots, to weaken their power of resistance to *Colletotrichum atramentarium*, considered to be the main cause of root rot in tomatoes under Irish conditions, although in itself a weak parasite. The authors recommend cropping as the best method both of bringing

about a proper balance of potassium and magnesium in the soil and of lowering its sulphur status, which is also desirable in controlling chlorosis. They show further that potassic manuring causes magnesium deficiency in many other crops.

JACKS (H.). **Soil disinfection II. Preliminary report on control of damping-off.**—*N.Z. J. Sci. Tech.*, A, xxvi, 6, pp. 357–358, 1945.

Experiments were conducted to determine the value of certain chemicals, previously shown by the author (*N.Z. J. Sci. Tech.*, A, xxvi, p. 186, 1944) to be effective against nematodes, in the control of tomato seedling damping-off (*Pythium ultimum*) [*R.A.M.*, xvi, p. 781]. Standard glasshouse-mixture soil, natural and sterilized, was inoculated with the fungus and after 7 to 10 days treated with the fungicides, transferred to boxes, 18 by 12 by 3 in., and a fortnight later planted with tomato seeds at the rate of 500 per box. The number of seedlings in the steam-sterilized series was taken as a standard, to which germination in the other lots was corrected. Formalin (40 per cent. formaldehyde) 1 in 80 was applied at the rate of $\frac{1}{2}$ gal. per box, and chloropicrin and DD (dichloropropane-dichloropropylene) in two ways, viz., (1) injected directly into the boxes at 2 ml. per 0·3 cu. ft., and (2) injected at half its depth into soil held in a closed container for 48 hours after treatment, chloropicrin at 2 and 4 ml. and DD at the weaker concentration only. All the treatments gave satisfactory results except DD injected directly into the boxes. Chloropicrin and formalin stimulated plant growth, and so did DD in one of the experiments in the closed-container series. Unlike formalin, the volatile chemicals did not modify the physical structure of the soil, necessitating frequent tilling.

ROLAND (G.). **Une nouvelle maladie du Chêne.** [A new disease of Oak.]—*Bull. Soc. for. Belg.*, lii, 1–6, pp. 29–33, 2 figs., 1945.

From 1941 to 1943 the author conducted a series of investigations into a serious oak disease, apparently new to Europe, occurring in a severely affected wood near Gougnies, Belgium. During the first year of attack, the leaves on certain branches become withered in summer; these branches are thin and shortened and the bark turns brown. The following spring, the dead branches leave in the top of the tree gaps which become more numerous every year. Small *Diplodia* pustules develop where the bark is torn. Finally, the tree loses its foliage and dies, sometimes three years after the first appearance of the symptoms. When a thick branch on an affected tree is sectioned, a dark brown liquid exudes from the periphery of the wood.

The disease was found to be due to *D. quercina*, the conidia of which germinate during wet days in summer and enter the branches through wounds, particularly those made by insects. Penetration is probably assisted by caterpillars biting the leaves, the fungus spreading to the branch. It seems unable, however, to spread from a branch to the trunk. Before a branch is killed, there must be present, in addition to infection, disturbance in the water balance, any natural or cultural factor leading to loss of water from the leaves appearing definitely to favour the disease.

Control consists in removing dead and affected trees and dead branches lying on the ground. The gaps in the stand should be replanted with another species, but not with beech or chestnut unless the environment is in every way suitable, since, though no attacks have been observed on these in nature, they both became infected in the author's inoculation tests. Where possible, insect control is desirable.

A survey showed the disease to be present in the vicinity of Gembloux, Seraing, Namur, Rochfort, Thuin, and Couvin. In upper Belgium and the southern part of middle Belgium the disease destroys large numbers of trees every year and thus constitutes a grave danger to the oak forests.

HARRIS (G. C. M.). **Chemical changes in Beech litter due to infection by Marasmius peronatus (Bolt.) Fr.**—*Ann. appl. Biol.*, xxxii, 1, pp. 38–39, 1945.

Chemical analysis of beech leaves, both infected by *Marasmius peronatus* and uninfected, collected a year after deposition from the deep litter in a pure beech wood in Berkshire showed that *M. peronatus* is unique among fungi at present known in that it is able to utilize the lignin fraction of the litter as its sole source of energy. This lignin it breaks down into a water- or acid-soluble state in which it can be attacked by other organisms. *M. peronatus* may play an important part in the rapid conversion of beech debris to an assimilable form. For the favourable growth of the fungus, a substrate, while not necessarily containing much cellulose, should contain a large proportion of unchanged lignin—a condition more nearly approached in litter than in grassland.

WATERMAN (ALMA M.). **Tip blight of species of Abies caused by a new species of Rehmiellopsis.**—*J. agric. Res.*, lxx, 10, pp. 315–337, 4 figs., 1945.

A detailed study of the tip-blight disease of Colorado fir (*Abies concolor*) in eastern Massachusetts previously attributed to *Rehmiellopsis bohemica* [*R.A.M.*, xii, p. 408] showed that the condition is due to a different species, which is named *R. balsameae* n.sp. It has now also been ascertained that in the collections described in the author's report on the geographical distribution of the disease [ibid., xvi, p. 786], only the fungus on native *A. lasiocarpa* found at Edgewood, British Columbia, is identical with *R. bohemica*, while *R. balsameae* occurs in the collections from native *A. balsamea* in northern Maine, from ornamental trees of *A. concolor* in southern Maine and New Hampshire, eastern Massachusetts, Rhode Island, and eastern New York, of *A. fraseri* and *A. nobilis* in eastern Massachusetts, and *A. cephalonica* in Rhode Island.

The first symptom consists in yellowish-pink spots on needles of the current season's growth when the bud scales begin to slough off. The twig bearing these needles generally continues to grow, but before it reaches mature size it turns dark brown or black, and becomes shrivelled, slightly curved, and brittle, and all the needles on it are affected by the fungus and turn yellowish-pink, then dark reddish-brown, and finally grey. The leaf margins roll backwards, so that diseased needles appear narrower than healthy ones, while they are also curved and bent out of their normal pattern of growth. On *A. concolor* small cankers may form round leaf scars where the fungus has entered the twig tissue from an infected needle.

The disease appears first on the lower branches, and the lateral twigs may be killed back to the node, though the terminal twigs may show only scattered infested needles. Severe infection of seedling balsam firs repeated for several years in succession may result in the death of the trees. Spread of the fungus is, however, so largely dependent on seasonal growth and moisture that if two or three seasons of heavy infection are followed by several seasons of light infection, the trees may recover to a remarkable degree. Firs of all sizes and ages are affected.

The fungus is characterized by amphigenous, usually epiphyllous, subepidermal, later erumpent, single or rarely aggregate, globose, black ascomata, which are pseudo-parenchymatous with differentiated periderm on all sides, opaque at the top, papilla-like, rupturing irregularly, and measuring 200 to 250 μ in diameter. The clavate to cylindric asci are short-stipitate, thick-walled, conspicuously thickened at the apex, 5 to 8 μ at the thickest point, straight or curved, measure 81 to 141 by 33 to 41 μ, are 16-spored, and have no paraphyses. The fusiform-elliptic, irregularly arranged, hyaline, 1-septate ascospores measure 31·5 to 49·9 by 6·3 to 12·6 μ. Conidia were not observed.

Inoculation experiments proved the fungus to be pathogenic on *A. concolor* and

showed *A. fraseri* to be susceptible. Small nursery trees of *A. fraseri*, *A. nobilis*, and *A. holophylla* planted in an area of infected *A. concolor* trees were susceptible to natural infection. Cross-infection from *A. balsamea* to *A. concolor* was obtained by planting a young *A. concolor* tree under a heavily infected native balsam fir.

While control is not feasible in forest conditions, satisfactory control was obtained on ornamental white firs by three applications of Bordeaux mixture (4–4–50) with casein spreader at intervals of 12 days. The first application should be made as soon as the new growth emerges from the buds.

MARTÍNEZ (J. B.). **La investigación de las alteraciones micológicas de la madera. 1er fascículo. Alteraciones del color del madera. Pudrición azul, pudrición verde, corazón roja de Haya, madera pasmada de Haya.** [The investigation of mycological changes in wood. Fascicle 1. Colour changes in wood. Blue rot, green rot, red heart of Beech, 'dozed' wood of Beech.]—lx+116 pp., 25 pl. (2 col.), 43 figs., 2 diags., 2 graphs, Madrid, Consejo Superior de Investigaciones Científicas, 1943. [French, English, and German summaries.]

Wood undergoes two types of change caused by fungi, namely, colour modifications and decay, of which only the former is discussed in this monograph, the first of its kind to be published in Spain, where no work had previously been carried out on a problem of great economic importance.

The studies have already yielded some interesting mycological and taxonomic data, including the presence in the country of three hitherto unreported genera, *Endoconidiophora*, *Chalara*, and *Bispora*, and ten similarly unrecorded species, viz., *Ceratostomella piceae* [*R.A.M.*, i, p. 277; ii, p. 50], with its conidial state *Graphium penicillioides* var. *ungeri*, *C. caerulea*, *E. caerulescens* [ibid., xxiv, p. 37], with its conidial state *Chalara ungeri*, *B. monilioides* (mention of which has been briefly made as an agent of beech decay in the Navarre Province [ibid., xxiii, p. 155]), *Ustulina vulgaris*, *Eutypa flavovirescens*, *Stereum fasciatum*, and *Coriolus* [*Polystictus*] *pergamenus*.

Ceratostomella pini, *C. piceae*, *C. caerulea*, and *Endoconidiophora caerulescens* are responsible for blue rot of pine (*Pinus sylvestris*) at Balsain (Segovía) and Guadarrama (Madrid).

No Spanish statistics are as yet available regarding the annual losses due to blueing. Directions, based largely on American experience, are given for the prophylaxis and control of the defect by appropriate silvicultural operations and antiseptic treatment of the finished boards in an alkaline bath consisting of a mixture of sodium carbonate and sodium bicarbonate at 4 and 5 to 6 per cent., respectively, in dry weather and at 8 and 11 per cent., respectively, during rainy periods. In Spain *Chlorosplenium aeruginascens*, the agent of 'green wood' has been collected on *Quercus ilex*, and *C. aeruginosum* [*Chlorociboria aeruginosa*: ibid., xvi, p. 3] on beech in several localities, including the Irati Forest, Navarre.

Associated with 'red heart' of beech [ibid., xxiii, p. 210] in the last-named district are *Fomes marginatus*, *Ganoderma applanatum*, *F. connatus*, and *Hypoxylon coccineum*, the mycelia of which penetrate through injuries into the parenchyma cells of the heartwood and cause the formation of vesicular tyloses in the vessels. In the course of dissolution the parenchyma cells undergo oxidation, resulting in the formation of brownish-red substances, especially wood gum, which diffuse into the adjacent vessels and fibres. Owing to its relatively low moisture content, the heartwood in general, and the 'red heart' zone in particular, is much more resistant to wood-decaying fungi than the sapwood. 'Red heart' generally develops irregularly, and is apparently composed of alternating pale and dark-coloured zones. The rancid odour, reminiscent of butyric acid, emanating from the affected tissues is a property of the above-mentioned gummy materials into which the starch and other nutrients of the invaded parenchyma cells are transformed. Other features

of 'red heart' are an increase in specific gravity and resistance to compression. Timber from trees affected by 'red heart' does not readily absorb preservatives, and is consequently rejected by the German State railways for cross-tie material if the discoloured zone (*a*) exceeds one-sixth of the surface in transverse section, or (*b*) occurs in the upper portion.

'Dozed' wood is another defect of beeches in the Irati Forest, similar to 'red heart' in the early stages, when it assumes the form of a red, brownish-red, or brown tongue penetrating from the cut surface right through the trunk. After four or five months white rot ensues, and the brownish-red zone is traversed by white bands interspersed with irregular, black, more or less stratified veins. A number of fungi have been found associated with 'dozed' wood in Central Europe, as many as 36 species being listed by E. Jahn in *Dtsch. Forstw.*, xiv, p. 452, 1932 (cited by F. Kollman in *Technologie des Holzes*, pp. 305–310, published by J. Springer, Berlin). In Spain the associated organisms include *U. vulgaris*, *Schizophyllum commune*, *Lenzites betulina*, *Polystictus pergamenus*, *Trametes cinnabarina*, *R. gibbosa*, *F. fomentarius*, *F. marginatus*, *G. applanatum*. The fungi thrive in the woody parenchyma of the sap wood, where the atmosphere is suitably humid and the cells contain ample food supplies. Tyloses and wood gum are produced, but the former are less numerous than in the case of 'red heart' and not so well formed.

'Dozed' wood is most prevalent in logs from spring-felled trees piled in humid sites, especially when decortication is delayed and the vitality of the outer annual rings and phloem is consequently maintained for a certain length of time. The symptoms of the disorder in such material become visible at the end of the spring or in early summer, but the development of 'dozing' actually reaches a climax in the autumn and is retarded only by severe winter frosts. The defect occurs in wood with a wide range of internal moisture (37 to 75 or more per cent.), the extensive fluctuations being attributable to the large number of fungi with diverse biological characters concerned in its etiology.

As in the case of 'red heart', dozed wood is only partially amenable to preservative treatment, and its resistance to decay rapidly declines so that after a year or two it is entirely unfit for further use. Losses range from 36 to 60 per cent. Control measures should include winter felling, early decortication, use of clean, protected sites for storage of logs, and the application of preservatives as soon as possible after felling.

CARTWRIGHT (K. ST. G.) & FINDLAY (W. P. K.). **Dry rot in wood.**—*Bull. For. Prod. Res., Lond.* 1 (4th Edition), 32 pp., 8 pl., 4 figs., 1945. 1*s*.

Serious and extensive outbreaks of dry rot (*Merulius lacrymans* and other fungi) in buildings after fires caused by air-raids have led the authors to publish a revised edition of this bulletin [*R.A.M.*, xviii, p. 76].

HATFIELD (I.). **Information on pentachlorophenol as a wood-preserving chemical.**—*Proc. Amer. Wood Pres. Ass.*, xl, pp. 47–67, 1944.

In this paper, read before the 40th annual meeting of the American Wood Preservers' Association, held in Chicago in April, 1944, the author aims at setting out the characteristics, qualities, and application of pentachlorophenol [*R.A.M.*, xxii, p. 47] as a wood preservative in the light of unpublished data and of experience over the last five years.

Pentachlorophenol has been in commercial use for too short a time for any extensive records of materials treated to be available. It is recorded, however, that an experiment begun in 1936 by the Forest Products Laboratory, Madison, Wisconsin, in which 198 pine posts were treated with pentachlorophenol solutions showed after seven years that all the posts were still in service, none showed

termite damage, and only five disclosed signs of some decay. Of 65 untreated posts set at the same time, 64 are unserviceable and all have been attacked by termites or decay.

Of 200 railway sleepers treated with pentachlorophenol dissolved in a practically colourless petroleum oil, and placed in service on the test tracks of the Cleburn and Cleveland line, Texas, in 1938 and 1939, all were in use and good condition when inspected in 1943.

It is too early to assess with any accuracy the quantity of fungicide required to give adequate protection over long periods of time. It is, however, suggested that pressure-treated materials for use in contact with the ground should usually be given a 10 lb. treatment, using a 5 per cent. solution of pentachlorophenol, or at least the treated wood should have a 0·5 lb. retention of pentachlorophenol per cu. ft. Proper penetration and retention of pentachlorophenol crystals in the wood is all-important, and in order to achieve this a suitable carrier for the treatment is no less so. Tables are presented showing the toxicity of pentachlorophenol to various wood-destroying fungi.

The author concludes by emphasizing the growing literature on the use and value of pentachlorophenol as an industrial preservative.

WRIGHT (E.) & HARTLEY (C.). **Green lumber shipments need protection.**—*Timberman*, xlvi, 5, pp. 100, 102–103, 2 figs., 1 graph, 1945.

Recent tests in western Oregon and Washington showed that sap or blue stain [*Ceratostomella* and other fungi] in green Sitka spruce [*Picea sitchensis*] and Douglas fir [*Pseudotsuga taxifolia*] sapwood boards is largely controllable by immersion in full-strength solutions of dowicide H, dowicide G, or santobrite [*R.A.M.*, xxiii, p. 507], which reduced the incidence of this defect from 55 per cent. in the former and 72 in the latter species after five weeks in bulk piles to less than 3. Lignasan was also effective against sap stain, but less so than the foregoing against surface moulds, which are, however, so readily brushed off as to be of negligible importance. Used at only quarter strength and extended with borax, the chemicals under discussion gave satisfactory results. In pine wood the agents of sap stain are generally less amenable to treatment: in an experiment involving five months' bulk piling, the maximum amount in any group of boards immersed in full-strength chlorophenate or lignasan was 8 per cent. compared with 69 in the untreated lots. Incipient decay in boards left piled for a year after treatment was reduced to a trace in western hemlock [*Tsuga heterophylla*] and Sitka spruce by lignasan and sodium chlorophenate, and in Douglas fir by a mixture of the same two chemicals at greatly reduced strength extended with borax, while the incidence in the untreated controls amounted to 26, 23, and 36 per cent., respectively. The dilute mixtures of the chemicals obtained by the addition of 3 to 6 lb. borax per 50 gals. solution not only exert a strong preservative action but also decrease skin irritation in workers handling freshly treated timber.

HAGER (B.). **Arsenical wood preservatives. The Boliden process in practice.**—*Chem. Tr. J.*, cxvi, 3015, pp. 221–222, 1945.

In this article (which appeared in the *Anglo-Swedish Review* for February, 1945), the author gives details of the application of the Boliden process of timber preservation to Swedish pine poles [*R.A.M.*, xv, p. 414; xvi, p. 649]. The impregnating solution is composed of arsenic acid, sodium arsenate, sodium bichromate, and zinc sulphate, and is introduced into the wood mainly by the open-tank treatment, for which there are now 11 plants in different parts of Sweden, operating up to a capacity of 20,000 cu. ft. per month. The full-cell pressure treatment is used for large-scale work. The poles (or sleepers) are generally steamed for 10 to 12 hours in one tank and then submerged in the chemical solution in another for

24 hours. Swedish pine absorbs about 16 lb. of solution per cu. ft. The sapwood content in the wood used for poles is roughly 60 per cent., and this is completely penetrated by the solution, containing after treatment nearly 1 per cent. by weight of arsenic acid. During 1940, some 1,500,000 cu. ft. of wood were treated in Sweden by the Boliden process, which has also been used in one plant in Norway since 1938.

Fungicidal tests by the wood-block method have shown that arsenic acid contents of 0·05 to 0·08 per cent. are sufficient to repel invasion by the cellar [*Coniophora puteana*] and cross-tie fungi.

The amounts of arsenic retained in the treated wood after 2, 15, and 30 days' leaching were 80, 67, and 64·7 per cent. of the original content, and further observations showed that only a small additional quantity is lost during a five-month period. Promising results have also been given by field tests proceeding at two localities since 1935.

WILSON (J. D.). **Organic fungicides and the control of vegetable diseases in Ohio.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxx, 233, pp. 49–61, 1945.

This is a tabulated summary of the reports published in 24 papers, most of which have been noticed in this *Review*, on the results of experiments in vegetable disease control by various organic compounds, including derivatives of dithiocarbamic acid, chloroquinones, and quaternary ammonium compounds. Judging by the data obtained in one year (1944) in Ohio, zinc dimethyl dithiocarbamate (represented by methasan) appears to be the most generally effective of the compounds tested, closely followed by fermate.

RICHARDSON (J. K.). **Black rot of Rutabagas.**—*Sci. Agric.*, xxv, 7, pp. 415–425, 10 figs., 1945.

Black rot of table rutabagas [swedes] due to *Xanthomonas campestris* [*R.A.M.*, xxiii, pp. 85, 283] has increased in severity since 1940 in many parts of Ontario. It was first reported on swedes in the province in 1907, but did not become of significant economic importance until 1939–40. It also occurs in Quebec and the Maritime Provinces, where, however, it appears to be unimportant.

In 65 samples of commercial seed tested, 0 to 6 per cent. of the seeds were found to be infected, but when 12 seed plants were grown from infected roots, it was not possible to isolate the organism at more than 7 in. from the infected root, and the pathogen was not detected in the seed. The organism was still pathogenic after a year's storage at 35° to 40° F., but remained viable for only four to five months at room temperature.

In a seed disinfection test, experimentally inoculated seed treated with mercuric chloride (1 in 1,000), semesan, ceresan, zinc oxide, spergon, cuprocide, thiosan, arasan, and fermate gave, respectively (average of five separate tests, 200 seeds each), seedlings showing 0·32, 1·34, 1·22, 1·9, 2·14, 1·63, 12·14, 16·71, and 21·06 per cent. black rot, as against 46·17 per cent. for the inoculated but untreated controls.

When steam-sterilized soil was inoculated with finely ground infected swede turnip roots and then planted with seedlings of Essex rape and Purple King and Laurentian swede turnip in November, 1942, the plants being harvested five months later, Essex rape showed 10·7 per cent. infection upwards through the root, 3·6 per cent. infection downwards through the crown, and 10·7 per cent. infection both ways, the corresponding figures for Purple King being 25, 0, and 50 per cent., and for Laurentian 64·3, 10·7, and 17·9 per cent.

During 1943 a critical examination of 20 fields planted with seed disinfected with semesan or mercuric chloride and of 12 planted with untreated seed showed that of the fields with no disease, two were planted with disinfected seed and none

with untreated seed, of those with a trace of disease, 15 were planted with disinfected seed and two with untreated seed, while of those with severe infection, none were planted with disinfected seed and six with untreated seed. It was apparent that under favourable conditions, the disease can spread very rapidly by rain splashing, insect transmission, and working in the crop when the leaves are wet. Many diseased fields showed definite infection centres, generally situated along surface washes or in depressions.

As a result of this work, over 95 per cent. of the seed planted locally in 1944 was disinfected either before packaging or by the growers. The weather favoured infection, but the disease was of little economic importance when seed disinfected with semesan or mercuric chloride was used, though it was severe in some cases where untreated seed was planted.

Growers are recommended to plant only treated seed. A four-year rotation (at least) should be practised, and swedes should not be planted in or adjacent to a field that grew crucifers the previous year. Planting should be carried out in well-drained fields. When the root cellar is cleaned out, refuse should never be put on the manure or compost heap, and after the removal of all debris the cellar should be sprayed with copper sulphate or formalin. If a field of swedes becomes severely infected shortly before harvest, it should be disposed of for immediate consumption.

WILSON (J. D.) & YOUNG (H. C.). **Comparison of various fungicides, diluents, and adhesives in controlling Cercospora leaf spot of Beets.**—*Bi-mon. Bull. Ohio agric. Exp. Sta.*, xxx, 233, pp. 62–72, 1945.

This is an expanded account of experiments carried out during recent years in Ohio on the control of sugar beet leaf spot (*Cercospora beticola*), a note on which has already appeared [*R.A.M.*, xxii, p. 508]. Prior to the introduction of resistant strains, the disease was a limiting factor in the production of the crop in some parts of the United States [ibid., ix, p. 696], its virulence in Ohio, for instance, steadily increasing from 1925 to 1935 and reaching a peak in 1938, when the reduction in yield was so heavy that the sprayed plots in an experimental block produced about 5 tons per acre more than the untreated [ibid., xix, p. 688]. In a series of 17 spraying and dusting trials covering the six-year period from 1938 to 1943, inclusive, the average yield increase amounted to at least 20 per cent. over the controls. Taking an average of five different comparisons, spraying gave somewhat better leaf-spot control than dusting, whereas the dusted plots produced larger yields. The average percentages of dead foliage on the sprayed, dusted, and untreated plots were 23, 32, and 75, respectively, and the corresponding yields 21·9, 22·3, and 18·5 tons per acre. Nocturnal treatments were slightly more effective, both as regards disease control and yield increase, than those applied in the daytime.

In comparative tests with six fixed-copper compounds and Bordeaux mixture or copper-lime dust, Bordeaux combated leaf spot more efficiently than the fixed coppers in liquid form, but when all were applied as dusts, some of the fixed coppers proved equal or superior to copper-lime dust. The basic copper chlorides (copper A and copper oxychloride sulphate, known as COC–S) gave rather better results than the basic sulphates (tribasic and basicop), while one oxide (cuprocide) was similar to the basic sulphates and another (brown cupric oxide) inferior in the control of *C. beticola*.

In an average of eight tests, the application of 1·5 lb. copper (calculated as the metallic equivalent) per acre reduced the percentage of diseased leaves from 83 to 39 per cent. and increased the beet yield from 16·9 to 20·3 tons per acre. A further increase in copper of roughly 1 lb. per acre brought the incidence of dead foliage down to 30 per cent. and raised the yield to 21 tons, and a summary of all the

available data on copper treatment indicates that 2·5 lb. per acre is a suitable dosage for the object in view.

A comparison of diluents showed no outstanding differences, and the value of adhesives and wetting agents was not clearly demonstrated.

DECOUX (L.) & WAUTHY (R.). **Étude des moyens culturaux de lutte contre la jaunisse de la Betterave sucrière, effectuée en 1942.** [A study of cultural methods of controlling yellows of Sugar Beet, carried out in 1942.]—*Publ. Inst. belg. Amélior. Better.*, xi, 5, pp. 509–528, 1943. [Flemish, German, and English summaries. Received July, 1945.]

Continuing their studies on the cultural control of virus yellows of sugar beet in Belgium [*R.A.M.*, xx, p. 145], the authors reached the following tentative conclusions. Heavy dressings of magnesia exerted a depressing effect on yield. Transplanting, after forcing, at normal sowing-time increased the growing period, decreased susceptibility to virus yellows, and increased yields. Removal of outer leaves apparently affected with the disease reduced yields, but increased the yield of tops and improved forage quality. When infection was severe, hoeing in August and September appreciably increased the yields of roots, sugar, and tops. Deep cultivation improved the yield and the sanitary condition of the beets. The most effective aphid [*Aphis fabae*] control was given by nicotine, tobacco dust, quassia chips, and sinaphit, while a single water spray killed a high percentage of the aphids. The removal and destruction of the first young plants to become infested with aphids retarded and reduced yellows.

KEN KNIGHT (G.). **Pea diseases in Idaho.**—*Bull. Idaho agric. Exp. Sta.* 253, 13 pp., 7 figs., 1944.

This bulletin provides growers with a succinct account of the pea diseases which occur in Idaho, together with practical recommendations for their control.

PRICE (W. C.). **Crystallization of southern Bean mosaic virus.**—*Science*, N.S., ci, 2629, pp. 515–516, 2 figs., 1945.

This paper describes the isolation in crystalline form of southern bean mosaic virus [*R.A.M.*, xxiii, p. 203] from highly purified preparations obtained by fractionating the juice from infected Bountiful bean plants, using alternating cycles of high- and low-speed centrifugation or by chemical treatment.

Solutions of the crystalline material produced characteristic symptoms of southern bean mosaic when used to inoculate Bountiful beans, while Early Golden Cluster beans showed lesions at concentrations as low as 10^{-8} gm. per c.c.

Much of the virus remained in the mother liquors, only 10 to 30 per cent. being obtained as crystals. The crystalline material is mostly protein and its homogeneity suggests relative freedom from impurities. Failures to isolate any such material from healthy plants show that the material is not a normal constituent of the bean plant. It has proved to consist of essentially spherical particles small and uniform enough to crystallize under appropriate conditions.

VOVK (A. M.). Тли — переносчики мозаичной болезни Лука. [Aphids—vectors of the mosaic disease of Onion.]—Микробиология [*Microbiology*], xiii, 4, pp. 180–184, 1944.

Ryjkoff and the author in 1936–7 demonstrated the transmission of onion mosaic [*R.A.M.*, xvii, p. 91] by the sap and now report investigations on insect vectors carried out in the greenhouse under controlled conditions. Insects reared on suitable hosts were transferred to infected onion plants for two to five days and then batches of 10 to 20 insects were put on young, healthy onion leaves. Infection

occurred after about 11 days with the aphids *Myzodes* [*Myzus*] *persicae*, *Neomyzus* [*M.*] *circumflexus*, and *Aulacorthum* [*Macrosiphum*] *pelargonii*. The mosaic is a very destructive disease, causing great reduction in the yield of bulbs and seeds. It overwinters in the bulb. The author reiterates his opinion that this disease differs from the onion yellow dwarf prevalent in the United States both in the nature of the virus and the symptoms, and that the disease described by Bremer in 1937 resembles the Russian mosaic. Repeated attempts to inoculate lily, hyacinth, and *Narcissus* with onion mosaic failed, and the mosaics on these Liliaceae are considered distinct from onion mosaic. It is recommended that onion seed should be obtained from healthy plants and not planted near seedlings of the former year or in ground on which infected plants have grown. To control the aphid vector is of the highest importance.

By analogy with methods used in the case of potato only stocks registered as resistant should be used to provide seed. Great interest attaches to the perennial onions Crezoon, Slezin, and Bootoon, which are reported to show only 1 per cent. infection as against 34 per cent. in the ordinary 'turnip' onion.

KEN KNIGHT (G.). **Control of storage diseases of Onions.**—*Circ. Idaho agric. Exp. Sta.* 92, 4 pp., 2 figs., 1944.

The author of this popular leaflet states that the most serious storage diseases of onions in Idaho are neck rot [*Botrytis allii*], bacterial soft rot [*Erwinia carotovora*], and *Fusarium* [*vasinfectum* var. *zonatum*], root and bulb rot (*Sclerotinia*) [*sclerotiorum*] and black mould [*Aspergillus niger*] also being important. The control measures recommended include field sanitation, care in handling bulbs, and good storage conditions. Bulbs for planting should be stored at 45° to 55° F. If they are held near freezing, the temperature of the room should be raised to 45° to 55° for a month at the end of the storage season.

LING (L.) & TAI (M. C.). **On the specialization of Bremia lactucae on Compositae.**—*Trans. Brit. mycol. Soc.*, xxviii, 1–2, pp. 16–25, 1 fig., 3 graphs, 1945.

Between 1942 and 1944, the genus *Bremia* was collected near Chengtu, China, on lettuce, *Lactuca indica*, *L. chinensis*, *Crepis japonicus*, *Sonchus oleraceus*, *Taraxacum mongolicum*, and *Saussurea affinis*, the forms from these hosts falling into three groups, based on the dimensions of the sporangia. The fungus from *Saussurea* (500 measurements) had large sporangia (22·9 to 37·2 by 20 to 32·9 μ), the fungi from *L. chinensis* and *C. japonicus* had small sporangia (10 to 21·5 by 8·6 to 20 and 10 to 21·5 by 7·2 to 19·2 μ, respectively), while the others formed a third group with sporangia of medium sizes. The fungus from *Saussurea* is regarded as a distinct species, for which the name *B. saussureae* Sawada is accepted; the others are regarded as *B. lactucae* and forms of that species. Successful cross-inoculations were made between lettuce and *L. indica*, but the other fungi were specialized to their natural hosts.

The taxonomy of *Bremia* is reviewed, and the following revision of nomenclature is proposed: *B. lactucae* Regel (syn. *B. elliptica* Saw.) on lettuce and *L. indica*; *B. lactucae* Regel f. *chinensis* f. n. on *L. chinensis*; *B. lactucae* Regel f. *sonchicola* (Schlecht.) comb. nov. (syn. *Botrytis sonchicola* Schlecht, *Bremia sonchi* Saw.) on *Sonchus oleraceus*; *B. lactucae* Regel f. *taraxaci* (Ito & Tokunaga) comb. nov. (syn. *B. taraxaci* Ito & Tokunaga) on *T. mongolicum*; and *B. lactucae* Regel f. *ovata* (Saw.) comb. nov. (syn. *B. ovata* Saw.) on *C. japonicus*.

Experimental evidence demonstrated that the sporangial dimensions could be influenced by temperature and by age. It is suggested that *Bremia* survives the hot part of the summer, when high temperatures prevent its growth, in infected seeds.

DAY (W. D.). **Report of the subcommittee on phytopathological technique. Chemical control of molds and bacteria on Cucurbit seeds.**—*Proc. Ass. Off. Seed Anal. N. Amer.*, 1942, pp. 40–42, 1943. [Lithoprint. Received June, 1945.]

After pointing out that seedlings of most species of Cucurbitaceae are highly susceptible to damping-off due to *Pythium debaryanum*, *P. ultimum*, *Phytophthora* spp., and *Rhizoctonia* [*Corticium*] *solani*, and that it has been found difficult in California to secure a stand of cucumbers or muskmelons in soils inhabited by these organisms, the author states that recently, however, seed treated with ceresan, cuprocide, spergon, semesan, or thiosan has produced fine stands in damping-off soils.

During 1942, a study was made to demonstrate the decay of seeds and sprouts by *Rhizopus nigricans* [*R. stolonifer*], *Penicillium* spp., and *Bacillus carotovorus* [*Erwinia carotovora*], to compare the value of various chemicals in the control of these organisms, and to determine the phytotoxic effect of the materials. Each member of the subcommittee received treated seeds of mixed cucumber, mixed muskmelon, Connecticut field pumpkin, green Hubbard squash, summer crookneck squash, and summer straightneck squash. The fungicides used were: (dips) 0·1 per cent. suspension of new improved ceresan and 0·75 per cent. suspension of American Cyanamid Chemical Corporation 154–6 B (betachlorethylethoxymercury-hydroxide), and (dusts) ceresan, thiosan, cuprocide, U.S.R.#601 (diluted to 5 per cent. organic formaldehyde), and U.S.R.#601 (diluted to 4 per cent. organic formaldehyde). The seeds were treated by shaking with an excess of dust for two minutes and then removing all excess material, or by soaking in a large volume of the dip suspension for 60 seconds, followed by drying. All the tests were exposed to alternating temperatures of 30° C. by day and 18° to 20° by night, paper towels being used as germination substrates.

The data obtained (averages from the final readings of three collaborators) showed that thiosan gave the best mould control and bacterial inhibition, while it caused almost no chemical injury. This material should be substituted for ceresan and new improved ceresan whenever possible. Also, it affords excellent protection against damping-off. Being only slightly soluble in water, it exercises a lasting protective action, whereas that of the ethyl mercurials is evanescent. With a long germination period, the superiority of thiosan becomes more apparent. Red cuprous oxide was highly fungicidal, but phytotoxic. Ceresan, new improved ceresan, and 154–6 B, if used at greater concentrations than in these tests, eliminate all mould growth. U.S.R.#601 is a non-metallic dust [*R.A.M.*, xxii, p. 291], the use of which should be encouraged in order to conserve copper and mercury. Even when diluted with two or three parts of talc or flour, it is a relatively effective fungicide. Applied at full strength, it completely eliminated mould, but produced distinct chemical injury.

PONTIS (R. E.). **Phytophthora capsici en frutos de Zapallito de tronco.** [*Phytophthora capsici* on Squash fruits.]—*Rev. argent. Agron.*, xii, 1, pp. 17–21, 1 pl., 1945. [English summary.]

Phytophthora capsici was first observed attacking squash (*Cucurbita maxima*) fruits in Mendoza, Argentina, in 1940, but no record of its occurrence on this apparently new host has hitherto been published. S. Zabala also reports the pathogen on squash in Salta. The symptoms correspond in the main with those already described on cucumber [*R.A.M.*, xx, p. 44], melon [ibid., xvi, p. 793], and watermelon [ibid., xix, p. 513]. The fungus causes a generalized wilt of the plant and a white rot of the fruits, and it is therefore recommended that the former term be applied in reference to infection of the stem and foliage and the latter to that of the fruits. Positive results were given by inoculation experiments on

squash, using Wiant and Tucker's technique [loc. cit.], melon, watermelon, chilli [ibid., xxi, p. 380], and tomato [ibid., xx, p. 501].

PRINCE (A. E.). **Fungi isolated from Peanuts collected in South Carolina in 1944.**—*Plant Dis. Reptr*, xxix, 14, pp. 367–368, 1945. [Mimeographed.]

Isolations from 222 groundnut seeds from 45 collections made in South Carolina in 1945 showed fungi present in 145. The organisms isolated [cf. *R.A.M.*, xxiii, p. 329] from five or more groundnuts and the frequency of their occurrence were as follows: *Alternaria* spp. from 10 seeds, *Diplodia natalensis* 5, *Fusarium oxysporum* 8, *F. reticulatum* 6, *F.* spp. 46, *Penicillium* spp. 5, *Sclerotium bataticola* [*Macrophomina phaseoli*] 8, *S. rolfsii* 6, *Trichoderma viride* 9, and sterile fungi 10. Little is known about the pathogenicity of these fungi, or their relative importance in seed groundnuts, but the list cited is believed to be a fair representation of groundnut seed-borne fungi in South Carolina. It is significant that these organisms are often correlated with an internal decay that may well be similar to the 'concealed damage' reported by C. and J. P. Wilson (*Plant Dis. Reptr*, xxix, pp. 61–63, 1945).

VITORIA (E. R.) & CERESA (M. C. D.). **Eficacia de los tratamientos 'antiperonospóricos' a base de sales de cobre, en la Provincia de Mendoza.** [Efficacy of 'anti-*Peronospora*' treatments with a copper salts base in the Province of Mendoza.]—*Rev. argent. Agron.*, xii, 1, pp. 30–37, 1945.

A tabulated account is given of replicated block experiments in the control of vine downy mildew (*Plasmopara viticola*) in Mendoza, Argentina, with three commercial products and Bordeaux mixture (*a*) 1 per cent. neutral, (*b*) 1 per cent. alkaline, (*c*) 2 per cent. alkaline, (*d*) 2 per cent. neutral, and (*e*) 2 per cent. alkaline, all being applied once only, on 23rd December, 1943, except in the case of (*e*) with which a second treatment was made on one series of plots on the following 27th January. Statistical analyses of the data by the method of variance resulted in the rating of one of the commercial products, 1 per cent. Bordeaux mixture neutral, and 2 per cent. Bordeaux mixture alkaline as 'good', and that of 2 per cent. Bordeaux mixture neutral as 'very good'. The superiority of the last-named, however, was not sufficiently striking to outweigh the additional cost and care needed in its preparation, and for practical purposes the 1 per cent. neutral or the 2 per cent. alkaline is recommended, the latter being preferable where experience in adjustment of the solution to neutrality is lacking. One treatment about mid-December should be adequate.

SOUKHOV (K.), VOVK (A. M.), & ALEXEEVA (Mme J.). Вирусные болезни растений в Киргизии. [Virus diseases of plants in Kirghiz.]—Микробиология [*Microbiology*], xiii, 5, pp. 256–260, 1944.

During their stay in Frunze the authors noted the presence of the following viruses: tobacco mosaic on tobacco, tomato, chilli pepper (*Capsicum annuum*) (50 per cent.), and eggplant (0·5 per cent.); tomato aucuba mosaic (a strain of tobacco mosaic); a ring spot of tobacco; tomato 'stolbur' [tomato big bud] not very frequent on tomato, tobacco, pepper, and eggplant; necrosis mosaic of potato resembling acropetal necrosis [due to potato virus Y]; potato aucuba mosaic (uncommon); and cucumber mosaic poorly developed on cucumber and melon. Mosaic of winter wheat occurred to a noteworthy extent, causing rosette symptoms with yellow-green stripes and spots on the leaves. Search for the 'zakuklivanie' mosaic [pseudo-rosette] of grasses [*R.A.M.*, xxiv, p. 13] was unsuccessful and several virus diseases common in European Russia were absent. A number of other virus diseases, not identified, are briefly recorded.

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BAWDEN (F. C.) & KASSANIS (B.). **The suppression of one plant virus by another.** —*Ann. appl. Biol.*, xxxii, 1, pp. 52–57, 1 pl., 1945.

Inoculations of potato, tobacco, and cucumber plants, using severe tobacco etch (S.E.V.), and mild tobacco etch (M.E.V.) viruses, potato virus Y (P.V.*Y*), *Hyoscyamus* virus 3 (Hy.V. 3), and a strain of cucumber virus 1 (C.V. 1) causing a mild mottle in tobacco (all viruses transmitted by *Myzus persicae* and having similar relationships with their insect vector) showed that S.E.V. prevents the multiplication of P.V.*Y* and Hy.V. 3 and replaces them even in plants in which they are established. M.E.V. reduces the concentration of P.V.*Y* but does not suppress it completely. C.V. 1 multiplies normally in mixed infections with any of the other three viruses.

It is suggested that the interactions of S.E.V., P.V.*Y*, and Hy.V. 3 differ from the phenomenon of reciprocal protection. Firstly, there is nothing to suggest that C.V. 1 is less closely related to Hy.V. 3 and P.V.*Y* than these are to one another. Secondly, although S.E.V. protects plants against P.V.*Y* and Hy.V. 3, M.E.V., which protects against S.E.V., does not completely protect against P.V.*Y* or Hy.V. 3 and only partially replaces them. It is possible that S.E.V. does not occupy all the sites suitable for the attachment of P.V.*Y* or Hy.V. 3 and so does not prevent the establishment of these viruses, but that it affects the metabolism of the cells so that some material or enzyme system essential for the multiplication of P.V.*Y* and Hy.V. 3 is no longer produced.

Plantesygdomme i Danmark 1939, 1941, 1942, 1943. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1939, 1941, 1942, and 1943. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xlv, pp. 193–265, 2 figs., 2 graphs, 1940; xlvii, pp. 190–277, 4 figs., 2 graphs, 1942; xlviii, pp. 1–90, 2 figs., 2 graphs, 1943; xlix, pp. 1–72, 1 fig., 2 graphs, 1944. [English summaries.]

These reports, compiled on the usual lines [*R.A.M.*, xxii, p. 90] by E. GRAM, H. R. HANSEN, and Anna WEBER, contain the following among many other items of interest, besides some already noticed from different sources. In 1939 *Helminthosporium avenae*, of rare occurrence in Denmark, was detected on a number of oats samples. In 1942 *Claviceps purpurea* was very prevalent on rye in parts of Jutland.

Beets are seldom attacked in Denmark by *Actinomyces* spp., which were responsible for heavy damage to mangolds and sugar beets in 1939. In 1944 *Uromyces betae* entirely destroyed beet foliage in several localities, and *Peronospora schachtii* was also very virulent, its intensity reaching a climax of 15 to 20 per cent. in July.

The numbers of new municipalities harbouring potato wart (*Synchytrium endobioticum*) in 1939, 1941, 1942, and 1943 were 11, 16, 17, and 14, respectively.

In 1944 the application to the soil of brassicol at the rate of 20 gm. per sq. m. prevented the development of *A. scabies* on radish.

P. schleideni [*P. destructor*] was exceptionally widespread, often in conjunction with *Stemphylium botryosum* [*Pleospora herbarum*], on onions in 1942.

In all the years under review, potato leaf roll and mosaic [ibid., xvii, p. 338] were prevalent and severe. In 1943 the provincial farmers' unions set up a joint organization aiming at the production of virus-free seed stocks.

'Stony pit' of pears [ibid., xxiii, p. 447] was very common in 1943, especially on the Greve A. W. Moltke variety in home gardens. In the same season, marginal leaf scorch of currants was, as usual, much in evidence: in three localities with soils of a high potassium content the trouble was effectively combated by applications of ammonium sulphate at a dosage of 6 kg. per are [100 sq. m.], whereas the same quantity of potassium sulphate aggravated the symptoms.

Phoma medicaginis [*Pleospora rehmiana*: ibid., xvi, p. 184] was observed for the first time in the country on lucerne in 1939, when it also reappeared on *Medicago lupulina*, a host in 1937.

Among new records may be mentioned *Septoria nodorum* on wheat in 1941; *Alternaria solani* on tomato leaves, *Gymnosporangium clavariiforme* on pears, and *Peronospora manshurica* on soy-bean foliage in 1942; and a condition suggestive of lily mosaic (*Cucumis* virus 1) [cucumber mosaic virus] in 1943, one of the affected varieties being *Lilium philippinense* var. *formosanum*.

VILJOEN (P. R.). **Report of the Department of Agriculture and Forestry for the year ended 31 August, 1944.**—*Fmg S. Afr.*, xx, 228, pp. 131–193, 1945.

The following items are among the brief references to plant diseases (pp. 189–190) in this report [cf. *R.A.M.*, xxiii, p. 251]. Good progress is being made in the production of seed potatoes free from the common virus diseases in South Africa and it is expected stocks will become available commercially in about two years. Wart disease [*Synchytrium endobioticum*] has not been observed for many years, and there is reason to believe that it has been eradicated.

A virus disease of apples (mosaic chlorosis) is being closely studied [ibid., xxiii, p. 134].

The so-called foot-rot diseases of wheat [*Helminthosporium sativum* and associated fungi: ibid., xx, p. 150] cause considerable damage in the Caledon and Bredasdorp areas. In the case of true foot rot [*Ophiobolus graminis*: loc. cit.], seed disinfection with ceresan or agrosan improved the stands.

On p. 182 it is stated that the position in those parts of the eastern Cape Province where jointed cactus [*Opuntia aurantiaca*] grows is again becoming serious, as the weed is spreading almost everywhere. In 1937, mechanical eradication was discontinued in favour of destruction by the cochineal insect [*Dactylopius confusus*], but this insect no longer seems able to keep the weed in check, mainly owing to infection by *Empusa* sp.

Eighteenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1944.—78 pp., 1944.

This report from Australia [cf. *R.A.M.*, xxiv, p. 91] contains, *inter alia*, the following items of interest. In further out-of-door pot tests in 1943 on the influence of plant depletion on the damage caused to wheat by take-all [*Ophiobolus graminis*: loc. cit.], sodium nitrate was included in the treatments given, being added to four contaminated and four control pots in each series. The results of the 1943 tests indicate that in the third year of the trial the total weight of the plants and the weight of grain borne by the plants in the pots receiving 250 gm. burnt lime were outstanding; plants with 250 gm. ground limestone and those with 250 gm. ground magnesite were also well above the corresponding plants grown in the native soil as well as in the native soil plus other chemicals. The roots in the three series mentioned, particularly those in the ground limestone treatment, were also freer from rotting than the others. There was no evidence of significant differences between any of the added chemical compounds on the number of pots containing

plants with whiteheads or plants with small, pinched grain. Comparing the contaminated with the uncontaminated native soil, the total weight of plants, and, to a less degree, the total grain weight borne in the pots to which the organism was added, were significantly greater than those from the uncontaminated controls. This is the second reversal in the relative magnitude of the yields, the position in 1943 being the same as in 1941 and the opposite of that in 1942. The addition of sodium nitrate in 1943 increased the total weight of the plants and their grain yield, but had no effect on grain size, the number of pots with white-headed plants, or the health of the root system.

Arrangements were made by the Commonwealth Department of Commerce and Agriculture through the State Departments of Agriculture for the permanent maintenance and multiplication of stocks of Up-to-date and Bismarck potatoes free from virus X [ibid., xxiv, p. 335]. All stocks incorporated in the scheme are labelled F X (free from X virus). The nuclear stocks are being multiplied in Tasmania for distribution to State Departments of Agriculture, who will place the produce with chosen farmers for further multiplication. Final distribution will be through the established seed certification schemes.

Further work was done on the selection and purification of the component strains of the tomato spotted wilt virus. The wide variability of the symptoms was adequately explained by the existence of these strains. Protective inoculation by means of the mild strain was shown to offer distinct possibilities, but it was found that the mild strain would have to be purified before it could be used to the best advantage.

In the winter of 1943 cauliflowers and swedes were attacked by broccoli mosaic [cauliflower mosaic virus: ibid., xxii, p. 122]. The vector was found to be *Brevicoryne brassicae*.

[In the previous report [ibid., xxiv, p. 92] it should have been stated that the work on susceptibility of citrus rootstocks to *Phytophthora citrophthora* was carried out by officers of the New South Wales Department of Agriculture.]

Fifty-seventh Annual Report of the Kentucky Agricultural Experiment Station for the year 1944.—68 pp., 1945.

In this report [cf. *R.A.M.*, xxiii, p. 430], it is stated that the tobacco variety Ky 41 A [loc. cit.] resistant to [black] root rot [*Thielaviopsis basicola*] is rapidly increasing in popularity in Kentucky, 52·2 acres being grown for seed by 39 farmers in 1944, as against 39·4 acres of Ky 16 by 24. There is enough seed of these two resistant varieties to plant the entire Burley acreage of the United States in 1945.

Several mosaic-resistant (N.N.) Burley varieties, including Ky 54 and Ky 55, produced by repeatedly back-crossing Ky 16 on mosaic-resistant plants of succeeding generations, were tested by farmers and found to be highly satisfactory as regards mosaic resistance and quality. Ky 34, a new Burley variety resistant to black root rot, *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xxii, p. 456], and mosaic (N.N.), in a test of 12 varieties yielded about one-third more than any other. Ky 150, a new mosaic-resistant (N.N.) dark tobacco, almost identical, except in mosaic resistance, with Brown Leaf, from which it was developed, gave satisfactory results in commercial plantings. Ky 160, a new, mosaic-resistant (N.N.) one-sucker variety, also gave satisfactory results in commercial plantings; it was developed by back-crosses of One Sucker on mosaic-resistant plants derived from Samsoun.

The organism causing bacterial black stalk of tobacco, found in comparative tests to differ from *Bacillus carotovorus* [*Erwinia carotovora*], *Bacterium* [*Xanthomonas*] *solanacearum*, *Pseudomonas fluorescens*, *P. aeruginosa*, and *P. polycolor*, was ascertained to have something in common with the carrot soft-rot organism,

E. carotovora, in point of pathogenicity, except that it produced a drier soft rot in tobacco stalks, tomato fruits, and potato. It became systemic in a [chilli] pepper plant and was isolated from necrotic spots in the fruit on a plant inoculated on the stalk. Typical black stalk was not produced by inoculation of tobacco plants of different ages.

Tests made to develop a method by which the roots of tobacco plants bearing the causal agents of wildfire [*P. tabacum*] and angular leaf spot [*P. angulata*] in the plant-bed could be freed from these organisms at transplanting showed that washed roots of wheat or tobacco dipped in a bacterial suspension developed more bacteria than unwashed roots. Plants so treated were dipped in various chemicals, re-potted, and then tested for bacteria after 24 hours. The number of infections which resulted was reduced from several hundred on untreated roots to a few by root treatment with Bordeaux mixture (2–2–100), copper sulphate and water (1 in 400), and iron sulphate, hydrated lime, and water (2–2–100).

The tomato pathogen *X. vesicatoria* was recovered from the roots of wheat plants during winter, growing outdoors in non-sterilized soil inoculated in the autumn. *Bacterium angulatum* [*P. angulata*] was again recovered from wheat roots in winter [ibid., xxiii, p. 476].

Cercospora cultures were made from 32 species of plants for comparison with the tobacco frog-eye fungus [*C. nicotianae*]. The cultures from *Petunia* and blackberry seemed quite different, while cultures from other species were very similar to cultures from tobacco, especially in the rapidly-growing vegetative phase.

Serious internal corky spots in the fruit and dropping were prevalent on previously affected Yellow Transparent apple trees not treated with borax, though no internal cork and only very slight dropping occurred on trees treated with borax in 1943. Winesap and Anoka trees were affected in 1944 for the first time.

Quince rust of apple [*Gymnosporangium clavipes*: ibid., xix, p. 28] for several years past has caused serious loss of fruit in the Western sub-station orchard. Trees sprayed in 1944 with a mixture of ½lb. fermate and 3 lb. wettable sulphur per 100 gals. yielded an average of 5 bush. per tree in the Stayman variety, 2 bush. in Delicious, and 1 bush. in Winesap more than trees sprayed with the same number of straight sulphur sprays (6 lb. per 100). Counts of dropped fruits from 12 trees of each variety from June to harvest showed that only 7 per cent. of those from the fermate-sprayed trees were infected, as against 53 per cent. for the straight-sulphur trees.

OSMUN (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1943–4* (*Bull.* 417), pp. 18–24, 1944.

This report [cf. *R.A.M.*, xvii, p. 502] contains, *inter alia*, the following items of interest. M. A. MCKENZIE and A. V. OSMUN state that *Ceratostomella ulmi* [ibid., xxii, p. 504; xxiii, p. 367] has been isolated from 17 trees in eight municipalities in Massachusetts; all the affected trees have been removed and burnt.

Rust of red [*Fraxinus pennsylvanica*], green [*F. p.* var. *lanceolata*], and possibly other species of ash caused by *Puccinia peridermiospora* [ibid., xx, p. 138] was very prevalent in the coastal areas of Massachusetts during the early summer of 1943.

Dealing with damping-off and growth of seedlings and cuttings of woody plants, W. L. DORAN states that working in co-operation with J. S. BAILEY he found that arasan or spergon, added to indolebutyric acid in talc, caused no injury to cuttings of the several species with which they were used. In work with L. SOUTHWICK such use of spergon prolonged the life of unrooted apple cuttings.

The application of a very dilute solution of formaldehyde to soil immediately after seeding was found to be a safe, convenient, and simple method for preventing post-emergency damping-off of plants. This treatment is readily combined with

sub-irrigation immediately after seeding. In the absence of any chemical soil treatment against damping-off, stands of vegetable seedlings under glass may be improved by postponing the first watering. Stands of eight commonly grown vegetables were better when the soil was not watered until three to five days after seeding.

In work with T. SPROSTON on onion smut [*Urocystis cepulae*], soil treatments with sodium nitrite, fermate, or urea markedly reduced severity of infection, though urea, unless applied to soil a considerable time before seeding, may adversely affect germination or growth.

Urea was a safe and effective soil fungicide with peas on a limed sandy soil. Fermate, applied to soil immediately before, or elgetol, ammonium dichromate, or potassium chromate, applied immediately after, seeding, gave good and safe control of damping-off of certain unspecified vegetables. As seed treatments for vegetables, ammonium, potassium, and sodium dichromate, diluted with graphite gave good results, comparable with those given by new proprietary treatments. Seed treatment of beet with arasan, of cucumber with semesan, and of lettuce with spergon prevented pre-emergence damping-off equally well, whether the soil was first watered 1, 2, 3, 4, or 5 days after seeding.

L. H. JONES states that when Havana Seed tobacco seedlings were established at a soil temperature of 70° and one-fourth were inoculated with a mosaic virus, and when 24 hours later the soil temperatures were altered to establish a range from 50° to 95° at intervals of 5°, at all temperatures the inoculated plants showed the typical pattern of mosaic infection by the thirteenth day, but on the plants at 90° and 95° terminal growth gradually stopped and a rosette of frenched leaves appeared at the top, while at temperatures under 90° the common mosaic pattern continued. These results were confirmed when the pots at 95° were interchanged with those at 50° soil temperature.

On p. 6, W. S. EISENMENGER and K. J. KUCINSKI state that in work on tobacco brown root rot [ibid., xvii, p. 774] carried out to determine the effect of the preceding crop on yield and crop index, it was found that sunflowers, Jerusalem artichokes [*Helianthus tuberosus*], tobacco, and fallow were satisfactory in this respect, buckwheat, barley, rape [*Brassica napus* var. *oleifera*], millet [*Panicum miliaceum*], wheat, and rye less so, and maize, oats, Sudan grass, and sorghum consistently unfavourable.

W. B. ESSELEN, W. H. FITZPATRICK, H. J. BRUNELL, and A. FILIOS (p. 45) state that commercially-grown mushrooms (*Agaricus* [*Psalliota*] *campestris*) can be dehydrated successfully. The thiamine, riboflavin, and nicotinic acid contents remain stable during dehydration and storage of the dried product. The rapid freezing of mushrooms gave a satisfactory, well-flavoured product, in which thiamine, riboflavin, and nicotinic acid were well retained. When *P. campestris* was fed to white rats as their sole source of protein, the animals survived and grew. All the essential amino acids appear to be present in mushrooms, though in lower concentrations than in casein. Chemical analysis showed that about 63 per cent. of the total nitrogen of mushrooms is present in the form of a protein. This protein was shown by chemical tests to contain phenylalamine, histidine, leucine, lysine, arginine, tryptophane, and threonine. The essential amino acids which failed to give positive tests were valine, isoleucine, and methionine, but animal feeding trials showed them to be present.

Sixty-fourth and sixty-fifth Annual Reports of the North Carolina Agricultural Experiment Station, 1940–1 and 1941–2.—83 pp., 31 figs., 2 maps, [?1941]; 92 pp., 21 figs., 1 diag., 5 graphs, 1 map, [?1942. Received July, 1945.]

The following items of phytopathological interest occur in these reports [cf. *R.A.M.*, xviii, p. 787], besides those already noticed from other sources. The use

of resistant varieties is the only effective means of cotton wilt [*Fusarium vasinfectum*] control. Coker 4 in 1 is highly resistant and very productive, and Clevewilt, Wannamaker Stonewilt, and certain strains of Dixie Triumph have also proved very satisfactory in these respects. Coker 100 wilt-resistant does not withstand infection quite as well as 4 in 1, but its yields are approximately the same, and it may safely be planted on lightly infested soils [cf. ibid., xxiii, p. 225]. Liberal applications of potash are of some assistance, in conjunction with the use of resistant varieties, in combating the disease, which is most prevalent and destructive in the light, sandy soils of the Coastal Plain.

Borax mixed into the fertilizer at rates not exceeding 25 to 35 lb. per acre gave good control of lucerne yellows [ibid., xxiii, pp. 110, 288] and increased hay and seed yields. At the Piedmont Branch Station in 1942, damage from boron deficiency on untreated soils ranged from 25 per cent. in Grimm to 49 per cent. in Turkestan, the reaction of Kansas Common being intermediate. No injury occurred among crops given 25 lb. borax per acre. The seed yield has been correspondingly increased, plots receiving borax producing 110 to 173 lb. per acre compared with 9 to 30 from the untreated.

Root, stem, and fruit rots of groundnuts are a limiting factor in the production of the crop under local conditions, among the pathogens concerned being *Fusarium* spp., *Sclerotium bataticola* [*Macrophomina phaseoli*], *Rhizoctonia*, and *S. rolfsii* in that order of prevalence.

Two promising new oat varieties resistant to smut [*Ustilago avenae* and *U. kolleri*] and rust [*Puccinia coronata*] are Lelina and Letoria, crosses between Lee and Victoria.

The most important spray applications for apple bitter rot [*Glomerella cingulata*] control were the third and fourth covers, and better results were obtained in 1941 by using 1 in 40 lime-sulphur up to and including the calyx and 4–4–50 Bordeaux thereafter than by either preparation alone throughout the season. In 1942 basic copper sulphate and copper oxychloride were tested as substitutes for Bordeaux (which causes severe russeting of foliage and fruit) against *G. cingulata* and black rot [*Physalospora obtusa*]. Neither they nor a weaker Bordeaux formula (1–3–50) were as effective as the stronger mixture, but copper injury was virtually obviated by their use.

Granville wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), best known as a virulent pathogen of tobacco, is assuming a severe form on home-grown tomatoes in the State, where Louisiana Pink is the only resistant commercial variety.

Pre-emergence seed decay and damping-off in lettuce were experimentally shown in 1942 to be largely preventable by seed treatment with yellow cuprocide or spergon, while pre-sowing applications to the soil of formaldehyde or chloropicrin were effective against the post-emergence phase of the disease.

Purple top [aster yellows virus] was responsible for heavy damage to potatoes [ibid., xxiv, p. 70] in 1942. A sample of table stock examined at Asheville contained 80 per cent. diseased tubers, while seed stocks from Yancey and Watauga Counties showed 38 and 30 per cent., respectively. The disease spreads rapidly from one planting to another, probably by means of insects.

BROWN (J. G.) & BOYLE (ALICE M.). **Crown gall cured with crude penicillin.**—*Desert Plant Life*, xvii, pp. 89–95, 5 figs., 1945.

The authors state that within a few hours of injecting penicillin (obtained from cultures of *Penicillium notatum* in the laboratory) into a gall [*Bacterium tumefaciens*: *R.A.M.*, xxi, p. 247] on *Bryophyllum pinnatum* small, brown areas appeared just above the punctures. The penicillin appeared, however, to diffuse upwards rather than laterally, and consequently a second method was tried in which cotton wool, soaked in penicillin, was wrapped round the gall and the latter then stabbed. The

'flesh' of the gall appeared watersoaked internally, turned brown, shrank and died and could easily be picked to pieces after a few days. The same treatment is claimed to have cured crown gall on apricots.

WHITE (P. R.). **Metastatic (graft) tumors of bacteria-free crown-galls on Vinca rosea.**—*Amer. J. Bot.*, xxxii, 5, pp. 237–241, 7 figs., 1945.

The author received from Dr. A. C. Braun bacteria-free tumours [*R.A.M.*, xxiii, p. 8] of *Vinca rosea* isolated as follows. Young, healthy plants of *V. rosea* were inoculated with the highly virulent brown peach strain of *Phytomonas* [*Bacterium*] *tumefaciens*, and after five days, the temperature was raised to 46° to 47° C. (lethal to the bacteria) for a further five days after which the plants were returned to the greenhouse at about 25° for about ten weeks. The author opened mature galls thus obtained and fragments of the softer tissue were removed and placed on a semi-solid medium. Of 23 aseptic cultures resulting one was selected from which a clone of 25 rapidly growing cultures was built up. The cultures were brilliant white, and in microscopic structure the general texture was uniformly open with many giant cells and scattered scalariform cells. A series of five pairs of primary xylem elements was found to be arranged in a perfect arc.

At the end of the twentieth passage (39 weeks after isolation) fragments of 17 cultures were grafted into young, healthy *V. rosea* plants by the double incision method. Of this series, four (24 per cent.) formed tumours. Of 42 grafts made from material of the nineteenth and twentieth passages 33 (79 per cent.) formed tumours of clean, smooth, fleshy texture, and up to 20 mm. in diameter, regularly exceeding in size those produced by inoculation with bacteria. The structure of these tumours and of the tumour-host connexion showed no significant difference from the bacteria-free galls of sunflower and *Nicotiana*.

YU (T. F.), WANG (H. R.), & FANG (C. T.). **Varietal resistance and susceptibility of Wheat to flag smut (Urocystis tritici Koern.). IV. Further studies on physiologic specialization in Urocystis tritici Koern.**—*Phytopathology*, xxxv, 5, pp. 332–338, 1945.

Further studies on physiologic specialization in wheat flag smut (*Urocystis tritici*) at the Tsing Hua University, Kunming, Yunnan, China [*R.A.M.*, xvi, p. 305] on material from widely scattered districts led to the separation of a further seven races in addition to the five already known, on the basis of differences in their pathogenicity to four common varieties, Tsing Hua No. 1932, N–716, Ngochen, and Grassland, and one poulard, Tsing Hua No. 559. Races 4 and 5 induce symptoms of intermediate severity on Nanking No. 715, a well-known flag smut-resistant variety. Race 12, collected on a poulard wheat, is the only race pathogenic to *Triticum turgidum*. Of the five races occurring in Yunnan, 2 is particularly widespread, having been represented four times in seven collections. The pathogenicity of races 1 to 5 has remained stable for 11 years.

JOHNSON (F.). **Epiphytology of winter Wheat mosaic.**—*Ohio J. Sci.*, xlv, 3, pp. 85–96, 2 figs., 1945.

The author gives a brief description of the mosaic disease of winter wheat (which is stated to occur in Illinois, Indiana, Kansas, Maryland, Nebraska, North Carolina, and Virginia) based on symptoms appearing on susceptible varieties infected under field conditions east of the Mississippi river. The affected areas were found to be irregular in shape, varying in size from a few feet in circumference to patches covering most of a field. The margins of these patches are more sharply defined than those surrounding diseased areas caused by unfavourable soil relations. There are two types of symptoms of wheat mosaic, the first, affecting the variety Harvest Queen, being characterized by a rosetted condition, accompanied by

excessive tillering, the plants acquiring a very dwarfed, compact appearance, and being darker green than healthy specimens. The second condition is produced in highly susceptible varieties, such as Purdue No. 1, Purkof, and Illinois No. 2, and causes stunting without excessive tillering, the plants becoming dwarfed, of compact appearance, with light yellow circular to oblong areas or showing large, chlorotic streaks parallel to the leaf veins, mingling with the normal green. This aspect constitutes what is known as yellow [*R.A.M.*, xxiii, p. 479], as opposed to green mosaic. Plants may survive the acute phase of the disease and produce imperfectly filled spikes shorter than those of healthy plants.

The virus is transmitted with difficulty by mechanical means, but the disease can be induced in wheat by subjecting plants grown in virus-infested soil for 18 days to temperatures of about 60° F. Attempts to transmit the disease by various insects and nematodes failed and several species of plants were inoculated, but none except wheat developed symptoms.

Two viruses may be considered as causing mosaic of winter wheat in the United States. The virus east of the Mississippi river is transmitted through the soil and induces the formation of vacuolated intracellular bodies in cells of affected plants. The western virus is not transmitted through the soil but an unidentified aphid is reported to be a vector; the virus produces no intracellular bodies in cells of diseased plants. The virus causing mosaic in Japan [ibid., xviii, p. 98] is probably closely related to the eastern virus present in the United States, but the wheat virus in Russia [ibid., xxi, p. 251; xxiii, p. 257] has characteristics of both the eastern and western United States viruses. The only practical method of control is to grow resistant varieties. Several of these, found by Koehler, Bonnett, and McKinney (Leafl. *Ill. agric. Exp. Sta.* and *U.S. Dep. Agric.* (Mimeographed), 1939) to give good yields in virus-infested soil, are listed in order of yield namely, Fulhard, Prairie, Nabob, Wabash, Fulcaster, Duffy, Thorne, Cooperatorka, Fulhio, Michigan Amber, Inivira, Harvest Queen 34–1, Red Wave, Shepherd, and Trumbull.

ÅBERG (E.). **Effect of vernalization on the development of stripe in Barley.**—*Phytopathology*, xxxv, 5, pp. 367–368, 1945.

At the Idaho Agricultural Experiment Station vernalized seed from North Carolina of six hooded barley varieties (Brugh 76, Huga, Tucker, Early Beardless, Hooded 16, and Iredell) and one rough-awned (Wintex) was sown on 8th April, 1944, for comparison with non-vernalized material of the same origin. The vernalization process was carried out at the Plant Industry Station, Beltsville, Maryland, and occupied a period of 38 days, during which the temperature in the refrigerator was maintained at 33° to 34° F. between 23rd February and 15th March and at 31° to 32° from 16th March until 1st April, when the seed, which had been kept moist, was dried for three days prior to despatch. Stripe (*Helminthosporium gramineum*) began to develop on the vernalized plots at the beginning of June, and at harvest on 29th July the incidence of the disease ranged from 15 per cent. in Hooded 16 to 62 per cent. in Brugh 76, whereas the maximum in the non-vernalized controls was 9 per cent. It is suggested that a technique for testing varietal resistance to stripe might be based on a vernalization procedure.

LEWIS (R. W.). **The field inoculation of Rye with Claviceps purpurea.**—*Phytopathology*, xxxv, 5, pp. 353–360, 1 fig., 1945.

A description is given of a technique devised at the Michigan Agricultural Experiment Station for the field inoculation of rye with *Claviceps purpurea* [*R.A.M.*, xviii, p. 314; xxii, p. 428, *et passim*] using a conidial suspension consisting of beaten and screened cultures of the fungus grown on moistened wheat for five or six weeks by Hynes's method [ibid., xxi, p. 135], to which is added an equal

weight of beet sugar. In this solution the spores can be stored for months without great loss of viability. The germination percentages of samples of these preparations after 38, 61, and 128 days storage at 18° C. were 70, 40, and 45, respectively, the corresponding figures for another series held at 0° being 70, 43, and 19, respectively. Some 4½ gals. of the sugar-spore suspension mixture can be made from 10 qts. culture.

Five fields were treated in 1943, three with a small orchard sprayer and two with a hand sprayer. In every field there was a great difference between the sprayed and unsprayed plots, the percentages of infected heads recorded in one field ranging from 22 to 43 and 3 to 6, respectively. The best time of day for the application of the conidial suspension is probably between 7 and 11 a.m., but further research on this factor and a number of others is requisite for the utilization to the best advantage of this new, good, and relatively simple method of ergot inoculation.

Reasonably well established facts concerning the quick decline disease of Orange trees.—*Calif. Citrogr.*, xxx, 4, p. 123, 1945.

The following facts relating to 'quick decline' of citrus [*R.A.M.*, xxiv, p. 312 and next abstracts] are embodied in a statement released by the Division of Plant Pathology, Citrus Experiment Station, University of California, Riverside, on 29th December, 1944. (1) The disease is at present confined to certain regions of the San Gabriel Valley. (2) The age of the affected trees ranges from two to 50 years and upwards. (3) The orchard soils concerned are predominantly of the light, sandy or gravelly texture normally regarded as ideal for orange cultivation. (4) During the last six years the area involved has extended, mainly to the north and east of Covina, while a second focus of infection has developed in the Sunnyslope section south-east of Pasadena. (5) The primary injury appears to be almost entirely localized in the fibrous feeder root system and smaller roots, which are destroyed. (6) Sudden wilting and foliar collapse are the secondary and most conspicuous effects of the disease on young bearing trees, but in the majority of cases the decline proceeds more slowly, the leaves fall gradually, and there is no complete collapse. (7) Collapsed bearing trees commonly produce yields above the average, but the fruits are often, though not invariably, below the average size. (8) Moderate to drastic pruning of affected trees results in some degree of recovery, though the top regeneration in such cases does not equal that of comparably treated healthy trees. (9) Hitherto, the disease has been observed only on sweet orange trees, such as Valencia and Navel, on sour orange rootstocks. (10) The wood and bark of the outer roots of trees in the incipient stages of 'quick decline' contain no starch [ibid., xxiv, p. 187] in contrast to the abundant reserves constantly present in the corresponding zones of healthy individuals. (11) The starch test applied to the inner surface of the bark above and below the bud union, which was found specific by Bitancourt for the diagnosis of 'tristeza' [root rot] in Brazil [ibid., xxiii, p. 484], gave entirely negative results when used on trees suffering from 'quick decline'.

Franco (C. M.). **Observações sôbre o 'quick decline' dos Citrus na California.** [Observations on the 'quick decline' of Citrus in California.]—*Biológico*, xi, 5, pp. 135–137, 1945.

Nine of the 11 facts accepted by the experts of the Division of Plant Pathology, Citrus Experiment Station, Riverside, California, as 'reasonably established' in relation to 'quick decline' [see preceding abstract] are equally applicable to the form of root rot known as 'tristeza' in Brazil [see next abstract]. At the time of writing, the author was still in doubt concerning the absence of starch in the outer root system of trees affected by the latter trouble, but the existence of this further corroborative symptom was verified, according to a footnote by N. da R., by

experiments in São Paulo. In another foot-note attention is drawn to a certain periodicity in the intensity of the reactions of diseased trees to the starch test, which does not, however, essentially modify the results. The author is convinced that 'quick decline' and 'tristeza' are the same disease, which probably spreads less rapidly in the cooler climate (with fewer insect vectors of the presumed virus agent) and on the sandy soils of California than under Brazilian conditions.

FRANCO (C. M.) & BACCHI (O.). **Investigações sôbre a 'tristeza' dos Citrus. 1. Alterações da pressão osmótica.** [Investigations on Citrus 'tristeza'. 1. Alterations of osmotic pressure.]—*Bragantia, S. Paulo*, iv, 9, pp. 541–551, 1 graph, 1944. [English summary.]

In healthy Bahia orange plants budded on sour orange stock, the osmotic pressure above and below the union of stock and scion is identical, whereas in those suffering from 'tristeza' [root rot: see preceding abstracts], it is much lower below than above (average of 8·71 and 12·45 atmospheres, respectively). The differences are even more noticeable in the roots.

SPERONI (H. A.) & FREZZI (M. J.). **Gomosis axilar de las ramas de los Mandarinos.** [Axillary gummosis of Mandarin branches.]—*Ingeniería agron., B. Aires*, vi, 4, pp. 163–167, 11 figs., 1944.

Since 1935, when it was first observed in the Province of Corrientes, *Diplodia natalensis* has been spreading through the citrus-growing districts of Argentina and causing a disease characterized by symptoms quite unlike those ordinarily associated with this fungus. Irregular, black cankers are formed at the sites of union of the main branches with the trunk and exude an abundant gummy secretion. One- to two-year-old branches shrivel six or seven months after the commencement of infection, while those of four to five years survive for a somewhat longer period, but in an enfeebled condition, with chlorotic, stunted leaves and scanty fruit. The pathogen appears to gain ingress to the host exclusively through injuries, the avoidance of which by rational pruning and cultural methods is an important means of control. Remedial measures are similar to those practised against foot rot (*Phytophthora* [*parasitica* and *P. citrophthora*]), comprising excision of the cankers and treatment of the resultant wound with 1 per cent. mercuric chloride, followed a fortnight later by the application of an impermeable paint. Inoculation experiments with *D. natalensis* on mandarin, sweet and sour oranges, and lemon gave positive results.

MARCHIONATTO (J. B.). **'Mompá', hongo perjudicial a los Citrus.** ['Mompá', a fungus injurious to Citrus.]—*Alm. Minist. Agríc. B. Aires*, xix, pp. 191–192, 1 pl., 1944.

In a previous paper (*Rev. argent. Agron.*, vi, pp. 73–75, 1939), the writer referred the citrus disease popularly known as 'mompá' in Argentina to *Septobasidium pseudopedicellatum* [cf. *R.A.M.*, xx, p. 13]. Subsequently he published a monograph on the species of *Septobasidium* in Argentina (*Darwiniana*, iv, pp. 248–263, 1941), in which the opinion was expressed that two different fungi were concerned in the etiology of 'mompá', viz. *S. pseudopedicellatum* and *S. guaraniticum* [*R.A.M.*, xxi, p. 14]. In order to avoid confusion, the latter and more common species will in future be regarded as the agent of 'mompá' and the former as that of a condition termed 'cinnamon crust'. *S. guaraniticum* is prevalent on oranges, mandarins, and lemons, parasitizing not only the scale insects (*Unaspis citri*, *Lepidosaphes beckii*, and *Aspidiotus hederae*) on the branches, but also the hosts themselves. The coccids are enveloped in a white film with a chestnut-coloured centre, and the mycelium passes to the cortex, on which it forms yellow to cinnamon-coloured lesions, $\frac{1}{4}$ to $\frac{1}{2}$ mm. in thickness, scutiform (2 to 3 cm. long) on the smaller branches

and circular on the larger ones. Later the central portion cracks and darkens to snuff-colour, with a well-defined border fringed with whitish strands. Infected twigs should be excised and burnt, while the lesions on the larger branches may be cut out, these operations being supplemented by the application of 1 per cent. Bordeaux mixture. Infestation of the trees by scale insects may be prevented by treatment with an oil emulsion, miscible oil, or lime-sulphur.

BARTHOLOMEW (E. T.) & SINCLAIR (W. B.). **Navel Orange peel oil and water spot.**—*Calif. Citrogr.*, xxx, 9, 1945.

The results are given of experiments carried out at the Citrus Experiment Station, California, on the nature of water spot of citrus [*R.A.M.*, xxi, p. 368], which is said to be a major problem of Navel oranges in California, and to cause very great losses in some areas. The experiments were planned to determine (1) the moisture and oil in Navel orange peel; (2) the oil in peel of Navel oranges grown in different districts; and (3) the oil from healthy and water spot Navel orange peel. The authors conclude (*a*) that oil sprays do not make Navel oranges susceptible to water spot by changing the quantity of water in their peel; (*b*) that in spite of the fact that the oil content of the peel is least in the districts where water spot is most prevalent, susceptibility does not appear to depend on the quantity of oil in the peel; and (*c*) that a surprisingly large proportion of the oil remains in the water spot areas of the peel for at least several days after they have become shrunken and brown.

BLACKFORD (F. W.). **A Ganoderma root rot of Citrus.**—*Qd J. agric. Sci.*, i, 4, pp. 77–81, 3 figs., 1944.

In September, 1942, a group of ten trees of the Beauty of Glen Retreat variety of mandarin budded on rough lemon stock in an orchard near Gayndah, Queensland, showed symptoms of an unusual type of root rot. One tree had been killed, and had already been uprooted. On the others, the leaves were chlorotic and falling off, while the fruits were small and prematurely coloured. Die-back of the twigs extended to the larger limbs. A few single limbs appeared to be normal and were later ascertained to be supported by an as yet unaffected part of the root. In the dead tree, every main root was rotted. The soil, which was very sandy, was tightly encrusted round affected roots of all sizes, and even, in some instances, round the crown and trunk of the stock. The wood and bark showed a dry, crumbly rot, and when the bark was lifted it broke away, revealing a buff-coloured, furry growth of mycelium on the root cortex.

By March, 1943, sporophores had developed on the upper surface and the fungus was identified as *Ganoderma lucidum* [cf. *R.A.M.*, xix, p. 174; xxiii, p. 369]. Evidence was obtained that infection originated from a dead native tree root, probably belonging to *Eucalyptus paniculata*. Two further cases were observed in other orchards, one of Washington Navel oranges on lemon stock and another of Ellendale Beauty mandarins on orange stock, in the former case the source of infection being probably *E. gummifera* and in the latter probably *E. tessellaris*.

All dead and severely affected citrus trees, with their rotted roots, were dug up and destroyed. The soil was removed from the butts of slightly affected trees, which were surgically treated, and the exposed surfaces disinfected with Bordeaux paint or lime-sulphur 1 in 6. The butt and roots were left exposed to the sun. Growers were recommended not to replant the diseased areas for at least three years.

WRIGHT (W. H.). **Omphalia root rot disease of the Date Palm.**—*Calif. Citrogr.*, xxx, 5, pp. 156–157, 1945.

Omphalia root rot [*O. pigmentata* and *O. tralucida*: *R.A.M.*, xxiii, p. 387], responsible for the most serious losses to the date industry in California, is spread by

planting infected offshoots. In view of the increased demand for offshoots, the date-growers, at a meeting held in January 1945, proposed that quarantine notices be served on proprietors known to have diseased palms as certified by the University of California, that all offshoots on diseased palms and on all palms within 70ft. of diseased palms should be burned under direction of the Agricultural Inspector. The growers seek an appropriation of State funds to finance the employment of a plant pathologist on a survey of *Omphalia* root rot.

HENDRICKX (F. L.). **Sur les fructifications conidiennes de Glomerella cingulata (Stonem.) Spauld. et v. Schr. (Sphaeriaceae).** [On the conidial fructifications of *Glomerella cingulata* (Stonem.) Spauld. & v. Schr. (Sphaeriaceae).]—*Commun. Inst. nat. Étude agron. Congo belge*, Recueil 1 (Hors série), pp. 12–15, 4 figs., 1943. [Received August, 1945.]

In this paper the author points out that the coffee parasite *Glomerella cingulata* [cf. *R.A.M.*, xxiii, p. 62] possesses several forms of conidial fructification, including those of *Gloeosporium coffeanum* and *Colletotrichum coffeanum*. He also observed that conidia of *G. coffeanum*, when germinated in a Van Tieghem's cell, sometimes become septate, corresponding to *Marssonia* [*Marssonina*], characterized by 2-celled, hyaline conidia developing in the acervuli. As they germinate, the conidia put out one or, more often, two germ-tubes, suggesting that a scission is present in every conidium. Furthermore the author also observed that the chlamydospores [or appressoria] are able to germinate as soon as the growth conditions allow, producing conidia on conidiophores not distinctly differentiated from the mycelium. This would place the fungus in the Mucedinaceae. After they have formed, the conidia are displaced laterally by the next conidium, but they may remain agglomerated. The hyphal conidia formed in this manner are less squat than those found in the acervuli on coffee leaves; they measure 12 to 24 by 3 to 5 (average 16·3 by 4·1) μ, while those formed on the leaves measure 10 to 16 by 4 to 6 (average 12·6 by 5) μ.

DESLANDES (J. A.). **Sôbre a queima do Algodoeiro no nordeste.** [On Cotton scorch in the North-east.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 1, pp. 3–18, 5 col. pl., 4 figs., 1944.

In 1935 H. P. Krug first demonstrated the presence of *Fusarium vasinfectum* on cotton at the Textile Plant Experiment Station, Alagoinha, Parahyba [*R.A.M.*, xvi, p. 380], and by the end of 1940, 281 foci of infection had been detected, and as far as possible eradicated, in that State and Pernambuco. The fungus is responsible for heavy losses, amounting to 95 per cent. of the crop in one test on the H. 105 variety in severely contaminated soil. As the term 'wilt' is inappropriate for the symptoms manifested and ambiguous, the author suggests that the disease should be termed 'scorch'.

The pathogen appears to thrive in low-lying, cool, damp, fertile, slightly acid (P_H6·5 to 5·0) soils of a light, sandy texture, with a good admixture of organic matter and some clay, producing rapid and luxuriant growth of the host. Two other associated parasites active under such conditions are *Rhizoctonia* [*Corticium*] *solani* and the nematode *Heterodera marioni*. Analyses of the affected soils revealed an adequate potash content, and neither this nor any of the other mineral fertilizers tested effected any reduction in the incidence of *F. vasinfectum*, but beneficial results were obtained by the incorporation of stable manure into the soil. The climatic conditions of the north-east, with its frequent periods of heavy precipitation, are favourable alike to host and pathogen.

Abelmoschus [*Hibiscus*] *moschatus* was shown to be an alternate host of *F. vasinfectum*, while other plants suspected of acting in the same capacity included *H. sabdariffa*, *Cassiatora*, *Crotalaria juncea*, and *Tephrosia nodiflora*. The occurrence of physiologic races is strongly indicated.

The remnants of diseased plants in the soil constitute the chief source of inoculum. The pathogen may also be transmitted by the seed—probably only to a very slight extent, but even ten infected seeds in a sack of a herbaceous variety, e.g., H. 105, would suffice to maintain a corresponding number of foci in the soil of the new planting site; hence the need for stringent supervision of the seed.

No indigenous varieties available at present combine desirable commercial qualities with resistance to the parasite. The arboreal forms, such as Mocó, though less susceptible than the herbaceous, do not enjoy the immunity that has been claimed for them. To cite some examples from the results of three years' varietal tests, Pima, Giza 3 and 7, Sakha 4, Foadi, Ashmouni, A. Jayawant C. 5480, Indu, Tangüis, Rhyne's Cook 307, Dixie Triumph 37–1795, Toole 38–1781, I.A. 7470–54480, and I.A. 7387–54010 proved resistant (under 10 per cent. infection), while the following gave a satisfactory performance under field conditions: Dixie 14–5, Dixie 14–5 strain 2, Dixie Triumph 85, Acala Mead 2387, I.A. 7470–54493, I.A. 7387–53998, A.F.C. 38–1295, A.F.C. 38–1303, Coker wild strain 2, Delfos 6–102–11, American Red C. 5510, A.F.C. 42–34–1302, A.F.C. 38–1299, R.U. 438–1894, Delta and Pineland II A. 38–1688–5, Delta and Pineland 10–38–1724, Rhyne's Cook, Ucala Shaffer, Texas 7111–028, and U. 44–438–1064 C.A.

The problem of combating the cotton wilt due to *F. vasinfectum* is immensely complicated by the simultaneous presence in the affected regions of *Verticillium albo-atrum*. For the moment, a systematic campaign against *F. vasinfectum* is impracticable owing to the absence, on the one hand, of resistant varieties, and on the other, of an organization for the control of seed production and distribution. Only the general sanitary precautions arising out of the foregoing observations can therefore be recommended.

LEONTOVITCH (C.) & DE SAEGER (H.). **Marasmius sp., nouveau parasite du Cotonnier dans le District du Congo-Ubangi.** [*Marasmius* sp., a new parasite of the Cotton plant in the District of the Congo-Ubangi.]—*Bull. agric. Congo belge*, xxxi, 1–4, pp. 137–143, 3 figs., 1940. [Flemish summary. Received July, 1945.]

Cotton in the native plantations of the Congo-Ubangi was observed to be affected by sporadic outbreaks of an apparently new disease which caused sudden death of the affected plants. In 1937–8, the affected area included the territories of Bumha, Lisala, and Budjala, i.e., the greater part of the forest area in the cotton-growing zone, and it is more than probable that the disease is present elsewhere also.

The first symptom is loss of turgescence in certain leaves, which in many cases are reddish-yellow, in October, when the plants are actively growing and the bolls have almost reached their maximum size. Later on, the leaves fall, leaving only the bolls which mummify on the dead plants or themselves drop. If the diseased plants are removed, remains of another plant, generally *Aframomum* sp., are usually found adhering to the collar, which is sometimes swollen and covered with a white to brownish-yellow mycelium. The woody vessels in the cotton stem are the colour of wine lees. The presence of the *Aframomum* fragments appeared to be the result of clearing the ground seven or eight months previously, and fructifications of the fungus were found on pieces of the rhizomes of this host lying on the ground. The fungus was identified as a species of *Marasmius*.

Before the disease can spread to cotton the stem tissues must have become lignified; young cotton is not attacked. The mycelium develops on the cotton stems immediately after contact has been made with the *Aframomum* débris, penetration taking place within ten days. Death of the cotton plant ensues most rapidly when the *Aframomum* is in contact with the roots. While isolated cotton plants are most commonly affected, several plants may be attacked together. The

fungus was also found on cut-down banana plants, and in one case had passed therefrom to cotton. It is always transmitted through contact with plant débris, on which it exists saprophytically. The sporophores develop only in the saprophytic phase or after the death of the parasitized host and under conditions of particular humidity; they rapidly dry up. In general, losses due to the disease are under 1 per cent., but are most severe in land poorly cultivated by natives on badly selected sites naturally fallowed for two to four instead of ten to twelve years. The removal and destruction of the affected cotton are recommended. *Aframomum* débris should be collected and burnt before earthing-up the cotton.

Le Coton au Congo belge. [Cotton in the Belgian Congo.]—*Bull. agric. Congo belge*, xxxii, 3, pp. 383–453, 12 figs., 4 graphs, 3 maps, 1941. [Flemish summary. Received July, 1945.]

In the part of this paper dealing with cotton diseases (pp. 408–413), it is stated that wilt, caused sometimes by *Fusarium vasinfectum* var. *gossypii* f. 1 [cf. *R.A.M.*, xix, p. 72; xxiii, p. 431] and sometimes by *Verticillium albo-atrum* [ibid., xviii, p. 248], appeared in the Uélé area of the Belgian Congo some years ago; the outbreak has been checked, but the danger persists. The dispersal of native plantations will limit spread, but complete eradication is hardly possible. The only really effective method of control is the use or development of resistant varieties, such as Dixie Triumph.

Stigmatomycosis of the bolls (*Nematospora coryli* and *N. gossypii*) [ibid., xxiii, p. 431] can be controlled only by the development of early resistant varieties, such as 145 Bambesa, which is almost immune in forest areas.

Anthracnose of the bolls, due to *Colletotrichum* [*Glomerella*] *gossypii*, *Gloeosporium* [*Glomerella*] *gossypii*, or *F. vasinfectum* [ibid., ix, p. 240; xviii, p. 248] can be controlled by planting resistant varieties and avoiding an excess of nitrogenous fertilizers.

Boll bacteriosis (*Bacterium* [*Xanthomonas*] *malvacearum*) [ibid., xv, p. 719] is not prevalent. The effects of damping-off (*Rhizoctonia* [*Corticium*] *solani*) [ibid., xv, p. 578] can be palliated by earthing-up the plants. Where practicable, control can be effected by treating the soil ten days before sowing with ceresan, applied at the rate of 5 l. per sq. m., at a concentration of 1 in 5,000; two days later, the ground should be dug over to a depth of 20 cm. and again treated.

Ezekiel (W. N.). **Effect of low temperatures on survival of Phymatotrichum omnivorum.**—*Phytopathology*, xxxv, 5, pp. 296–301, 1 map, 1945.

Tests were carried out at the Texas Agricultural Experiment Station to determine the reaction of the cotton root-rot fungus, *Phymatotrichum omnivorum*, to low temperatures [*R.A.M.*, xviii, p. 590], a matter of practical importance in relation to the possibility of its survival if introduced into areas north of its present range. The pathogen did not withstand more than 24 hours' exposure in the laboratory to a temperature of –13° C. either in the form of vegetative growth on potato dextrose agar slants, in large sclerotial masses high on the walls of flask cultures, or as portions of sclerotial masses on agar slants or buried in moist soil. Growth was inhibited at 5°, but even after 50 days there was no reduction of viability.

The northern limit to the natural occurrence of root rot is in general agreement with several summaries of recorded temperatures (*Yearb. U.S. Dep. Agric.*, pp. 701–747, 1941), notably in respect of the line at which the minimum observed air temperatures reached 23°. In conjunction with the susceptibility to cold shown by *P. omnivorum* in laboratory trials, this relationship suggests that the northward spread of the disease has been limited by the prevailing temperatures, and that the organism is unlikely to establish itself north of its present range.

BRANTLEY (C. O.). **Japanese Beetle grub control.**—*Greenk. Reptr*, xiii, 2, p. 19, 1945.

Ample supplies of milky disease [*Bacillus popilliae*] spore dust for Japanese beetle [*Popillia japonica*: *R.A.M.*, xxiv, p. 101] control are stated to be now on the market. The spores have been shown to persist in the soil for as long as four years, even after the extermination of all the grubs, and to survive passage through the alimentary tract of birds and small animals, as well as extremes of heat and cold: they are, in short, practically indestructible. The method is economical, 1 lb. dust sufficing for the treatment of 4,000 ft. The preparation, which is harmless to man and livestock, is most effective and speedy in action when applied in the late summer, just after the eggs of the beetle have been laid, or in the spring, immediately prior to the pupation of the grubs. The pathogen multiplies so rapidly in feeding that the death of a single infected grub will release 3,000,000 to 9,000,000 more living spores.

HENDRICKX (F. L.). **Une épidémie fongique du Criquet Zonocerus variegatus L. due à Empusa grylli (Fres.) Nowak.** [A fungal epidemic of the Variegated Grasshopper *Zonocerus variegatus* L. due to *Empusa grylli* (Fres.) Nowak.]—*Commun. Inst. nat. Étude agron. Congo belge*, Recueil 1 (Hors série), pp. 16–20, 3 figs., 1943. [Received August, 1945.]

Between December, 1939 and March, 1940, important losses were caused, particularly to cotton and *Pennisetum*, at Bambesa, Belgian Congo, by the variegated grasshopper, *Zonocerus variegatus*, but with the onset of the rainy season the insects rapidly became less numerous as a result of epidemic infection by *Empusa grylli* [*R.A.M.*, xxi, p. 45]. During the dry season the disease remains latent but becomes epidemic at the first rains. The conidiosporangia formed on the first victims are expelled on to their immediate neighbours, presumably in the evening when the insects collect together to sleep. Locally, atmospheric humidity reaches 100 per cent. at night, and this is when the projection of the conidiosporangia takes place most readily. How the fungus continues to exist in the dry season is not definitely known.

At Bambesa, the sporangiophores were distinctly claviform, non-septate, and measured 114 to 164 by 13 to 20 μ. The unicellular, hyaline, piriform or oval conidiosporangia measured 32·8 to 40·4 μ long. Large, hyaline, round, oval, or reniform hyphic bodies gradually spread in infected insects and finally replace the tissues, sporangiophores being formed on the death of the insect.

LANGERON (M.) & GUERRA (P.). **Les secteurs clairs et sombres des colonies de levures.** [Pale and dark sectors of yeast colonies.]—*Ann. Parasit. hum. comp.*, xviii, pp. 95–111, 6 pl., 1941. [Received April, 1945.]

Pale and dark sectors have been observed in cultures of *Candida guilliermondi*, *C. pseudotropicalis*, *C. parakrusei*, *C. flareri*, *C. pelliculosa*, *C. albicans* [*R.A.M.*, xviii, p. 253], and *C. triadis*, *Rhodotorula* sp., four species of *Torulopsis*, of which *T. pulcherrima* is the most striking, *Hansenula anomala*, *Zygopichia chevalieri*, *Saccharomyces pastorianus*, *Debaryomyces matruchoti*, *D. klöckeri*, *D. guilliermondi*, *D. hudeloi*, and unnamed strains of the same species. The authors discern a correlation between the development of sectors and that of the R and S phases, both processes being dependent on morphogenetic factors and readily reversible. It is important that these facts should be realized in order to guard against the erection of new species on the basis of morphological variations of the kind under discussion.

As examples of mistakes of this sort the authors state that both *Monilia castellanii* and *Cryptococcus interdigitalis* Poll. & Nann. 1936 are undoubtedly the same

as *T. pulcherrima*. The organism named *C. castellanii* by Redaelli is quite different from the true *M. castellanii*, but is identical with *D. matruchoti* Grig. & Peju 1921. The authors consider that the pathogenic role of *Debaryomyces* is very doubtful.

MACKINNON (J. E.) & ARTAGAVEYTIA-ALLENDE (R. C.). **The so-called genus Candida Berkhout.**—*J. Bact.*, xlix, 4, pp. 317–334, 7 figs., 1945.

In these studies at the Institute of Experimental Hygiene, Montevideo, Uruguay, the auxanographic methods of European workers [*R.A.M.*, x, p. 692; xiv, p. 392] were found to be essential to the correct identification of the 14 species of *Candida* investigated. The existence of true dissociation or hereditary changes in some members of this heterogeneous group is regarded as indisputable. One type of variation may be related to the 'R' form of bacteria (Mackinnon's 'membranous variant') [ibid., xix, p. 344] and another, observed in *C. albicans* (Robin) Berkh., 1923, to the 'lethal races' described by Krassilnikov (*Bull. Acad. Sci. URSS*, pp. 364–366, 1934) and Nadson (Changements des caractères héréditaires provoqués expérimentalement et la création de nouvelles races stables chez les levures. Hermann et Cie, Paris) in connexion with *Saccharomyces cerevisiae*.

Like *C. pseudotropicalis* (Cast.) Basgal, 1931, the perfect state of which was found to be *S. fragilis* [*R.A.M.*, xviii, p. 525], *C. krusei* (Cast.) Berkh., 1923 (indistinguishable from *Mycoderma cerevisiae*), has been shown to possess an ascogenous phase referable to the genus *Pichia*.

C. tropicalis (Cast.) Berkh., 1923, a very important species from the medical mycologist's standpoint, comprises strains producing an abundance of true hyphae, which may in turn give rise to arthrospores, and even appressoria. Chlamydospores were not observed. *C. intermedia* (Cif. & Ashf.) Langeron & Guerra, 1938, differs in various important respects from *C. tropicalis* and is considered to be devoid of medical interest.

C. pelliculosa Redaelli, 1925, seems to approximate more closely to *Torulopsis* than to *Candida*, while *C. flareri* (Red. & Cif.) Langeron & Guerra, 1938, is believed to have originated as a white variant of *Rhodotorula mucilaginosa*.

C. albicans and *C. stellatoidea* (Martin, Jones, Yao, & Lee) Langeron & Guerra, 1939, possess a number of common features, including the production of true mycelium, similar chlamydospores, and 'membranous' or 'R' variants. *C. stellatoidea*, however, differs from *C. albicans* in its negative auxanogram with sucrose and in its non-pathogenicity to rabbits, and must be admitted as a valid species. In the writers' opinion, Langeron and Guerra were dealing with the 'R' form of *C. albicans* and not with *C. stellatoidea*.

Neogeotrichum pulmoneum (*Oidium brasiliense*) Magalhaes 1918 (*Mem. Inst. Osw. Cruz*, xxvi, pp. 151–167, 1932), is thought to be identical with *C. suaveolens* (Lindner) Langeron & Guerra, 1938. The supposed responsibility of the latter for bronchomycosis appears to rest on confusion with two true pathogens, *C. tropicalis* and *C. albicans*.

Conant's claim that *Syringospora* Quinquaud was the first validly published genus for these yeasts [*R.A.M.*, xix, p. 555] is accepted. Some species, such as *C. albicans*, *C. stellatoidea*, and *C. parakrusei* (Cast.) Langeron & Guerra, 1938, are common parasites of the mucous membranes, which seem to constitute their normal habitat, while others, e.g., *M. cerevisiae* (*C. krusei*), *S. fragilis* (*C. pseudotropicalis*) and *C. chalmersi* (Cast.) Basgal, 1931, are saprophytes outside the human body. *C. brumpti* (Langeron & Guerra) Langeron & Guerra, 1938, has been reduced by some authors to synonymy with *C. parakrusei*, but the present writers do not concur in this view, since the former species does not ferment glucose, grow at 37° C., or utilize sucrose, whereas it does produce true mycelium and chlamydospores.

MILLIKAN (C. R.). **'Damping off' disease of Flax.**—*J. Dep. Agric. Vict.*, xliii, 4, pp. 177–181, 6 figs., 1945.

Damping-off of flax seedlings occurs in all the principal flax-growing areas of Victoria [*R.A.M.*, xxiii, p. 55], where the P_H values of the soils range from 5 upwards. Occasionally, the disease has resulted in very unsatisfactory brairds, but on the whole its effects have been of minor importance. The condition is favoured by any factor which delays the rapid germination and emergence of the seed, such as very cold weather, deep sowing, and excessive soil moisture. The formation of a hard crust on the ground surface in very dry weather also aggravates the disease. The vigour of individual seed lots sometimes appears to affect incidence, and some crop failures due to damping-off have occurred where pasture has been ploughed up and sown at once to flax.

Numerous isolations were made from affected material, but the only fungus consistently obtained was a species of *Pythium*, the oospores of which, measuring 13·8 to 15·2 μ in diameter, were readily found in the roots and cotyledons.

Lime applied to soil in pot tests on withertop [calcium deficiency] disease [ibid., xxiii, p. 228] had a marked effect on damping-off twelve months later. In Gnarpurt soil, incidence for the following treatments, viz., superphosphate 1 cwt. per acre, and the same plus slaked lime 1, 2, and 4 tons (P_H 6, 7·1, 7·6, and 7·9, respectively), was 46·5, 22, 12, and 10·5 per cent., while in Digger's Rest soil (P_H 7·1, 7·6, 7·9, and 8·2, respectively), the corresponding figures were 34·7, 12, 14·7, and 12·3 per cent. The exact reason for this effect has not been ascertained.

When flax seed, half of which had been treated with a fungicidal dust, while the remainder was untreated, was sown at Lismore in soil with P_H 5·1, the treated seed germinated well, but the germination of the untreated was uniformly bad and the surviving plants showed severe *Pythium* damage. A test was then conducted in which a sample of the untreated seed (a large proportion of which showed cracks in the seed coat) was treated with various dusts and sown in the area where the crop had failed. Four of eight blocks received lime at the rate of 2 tons per acre immediately before sowing. Very dry conditions prevailed, and the seedlings which failed to emerge showed numerous reddish-tan lesions associated with *Pythium*. The percentage emergence was 19·1 for the untreated seed, 30·2 for spergon (4 oz. per bush.), 34·6 for new improved semesan jr. (4 oz.), 34·4 for nomersan (8 oz.), 25·2 for ceresan (4 oz.), 39·4 for new improved ceresan (4 oz.), 27·5 for agrosan (4 oz.), and 30·3 for agrosan (8 oz.). Emergence in the lime-treated plots was 31·5 per cent., as against 28·6 per cent. in the untreated. One month after treatment, during which period the treated seed was kept in air-tight containers, a germination test showed that the seed treated with new improved ceresan gave only 52 per cent. normal seedlings, while the radicles of the abnormal seedlings were much swollen, against 89 per cent. normal seedlings for the untreated seed, and 83 to 90 per cent. normal seedlings for the other treatments. The seed treated with new improved ceresan should be sown as soon after treatment as possible.

COCHRANE (V. W.). **The effect of brief temperature treatments on germination of urediospores of Phragmidium mucronatum (Fr.) Schlecht.**—*Phytopathology*, xxxv, 5, pp. 361–366, 1945.

Large increases in the germination of single-line rose rust (*Phragmidium mucronatum*) uredospores from a Californian collection at 6° to 9° C. were effected by ten minutes' warming the germinating spores in an incubator at 27°, the maximum (amounting to 526·3 per cent. over the control in one test at 6°) occurring when the exposure was made within eight hours of sowing; after 24 hours the high temperature failed to stimulate the process. The germination of the uredospores at temperatures above or below the optimum was significantly raised by one hour's preliminary incubation at the optimum of 18°, spores treated in this manner

and then exposed to temperatures of 6°, 9°, 24°, and 27° showing increases over the controls, held throughout at these temperatures, of 725, 163, 16, and 308 per cent., respectively.

These observations point to the need of extreme care in the adjustment of the temperature in germination experiments. It should be remembered, moreover, that in nature a brief spell of favourable temperature may induce spore germination on the leaf even under generally adverse weather conditions, a consideration suggesting caution in the application of laboratory data to field problems.

CREAGER (D. B.). **Saving Picardy bulbs by chemical treatments.**—*Gladiolus Suppl.* [*New Engl. Gladiolus Soc.*], ix, 1, pp. 2–3, 1945. [Abs. in *Chem. Abstr.*, xxxix, 11, pp. 2371–2372, 1945.]

Apparently sound, size 5 Picardy *Gladiolus* bulbs were selected from a lot in which 10 to 15 per cent. were discarded on account of *Fusarium* brown rot [*F. oxysporum* var. *gladioli*: *R.A.M.*, xxiii, p. 300] and divided into three equal batches, one being immersed for 15 minutes in new improved ceresan (½ lb. per 25 gals. water plus 5 tablespoonfuls Grasselli spreader-sticker), another in 1 in 1,000 mercuric chloride solution for 14 hours, and a third left untreated as a control. The number of bulbs was counted at the end of the first year and the same bulbs were replanted the second year, with the identical treatments. The results showed new improved ceresan to be greatly superior to mercuric chloride for the purpose in view, the number of bulbs surviving at the end of the second year being about twice as high in the former as in the latter series. None of the untreated bulbs was dug at the end of the second year. Similar, but even more striking results were obtained by the application of the same preparations to bulblets and the small stock arising therefrom. The injury to bulbs from new improved ceresan reported by some growers may be attributed to planting in dry ground or to undue delay in planting after treatment.

CREAGER (D. B.). **Summary of 1944 Gladiolus disease control studies in Illinois.**—*Gladiolus Suppl.* [*New Engl. Gladiolus Soc.*], ix, 1, pp. 3–5, 1945. [Abs. in *Chem. Abstr.*, xxxix, 11, p. 2372, 1945.]

Out of a total of 660 Picardy *Gladiolus* bulbs in each lot, the numbers of healthy ones produced after various treatments [against *Fusarium oxysporum* var. *gladioli*: see preceding abstract] were: new improved ceresan (½ lb. per 25 gals. water) for 15 minutes, 504; 1 in 1,000 mercuric chloride for 14 hours, 476; 0·5 per cent. lysol for three hours, 401; 0·5 per cent. compound cresol solution U.S.P. XI, 398, and control, 165. Picardy bulblets immersed for 14 hours in cresol, lysol, or mercuric chloride at the foregoing dosages yielded, respectively, 38, 36, and 23 lb., compared with 31 for the control lot. Five consecutive lots of bulbs were treated with one batch of new improved ceresan without reduction of efficacy. Du Pont (Grasselli) spreader-sticker was found to be the best of the wetting agents tested. Semesan and a number of inorganic mercury compounds, as well as immersion in water heated to 122° F., proved less satisfactory for the control of the disease.

HANSEN (H. N.) & THOMAS (H. EARL). **Diseases of Fremontia.**—*Madroño*, viii, 2, pp. 39–42, 1 pl., 1945.

The following diseases restrict the cultivation in California of *Fremontia*, an attractive ornamental of south-western origin. Stem-girdling (*Phytophthora cactorum*) was first observed on nursery stock in 1934, since when it has been prevalent on specimens of *F. californica*, *F. napensis*, and *F. mexicana* up to 15 ft. in height. The bark is killed right round the stem at or near soil-level, occasionally higher, and wilting of the parts above the necrotic area soon ensues. Inoculation experiments with pure cultures of the fungus gave positive results both on wounded and

uninjured stems. Excess moisture and inadequate drainage appear to be largely responsible for this destructive disease, the incidence of which could be reduced by attention to these factors.

Verticillium albo-atrum has occasionally been observed attacking the roots of cultivated species, its mycelium invading apparently sound tissues and ultimately extending through most of the xylem, even of the petioles and leaf veins. The stele becomes discoloured, the plants are stunted, and the foliage wilts and falls. Small specimens are killed in three to five months. Inoculation experiments on the three above-mentioned species were successful.

Hendersonia fremontiae Harkn. n. comb. (*Ascochyta fremontiae* Harkn.) produces dark- to black-edged, necrotic lesions of varying sizes on the leaf blades of *F. californica* and *F. napensis* in nature and has been inoculated into the same species and *F. mexicana* with positive results. The colour and multiseptate condition of the conidia and other characters of the fungus necessitate its transference from *Ascochyta* to *Hendersonia*.

Septoria angularis n. sp. forms angular, brown, extensively coalescent, necrotic spots on *F. mexicana* and was successfully inoculated into the other two above-mentioned species. The fungus is characterized by subepidermal, erumpent, densely aggregated, globose, ostiolate, black pycnidia, 50 to 70 μ in diameter, and oblong, predominantly uniseptate, hyaline conidia, 10 to 17 by 1·5 to 2 μ.

PIRONE (P. P.). **Control of the gall disease of Gypsophila caused by Phytomonas gypsophilae (Brown) Magrou.**—*Phytopathology*, xxxv, 5, pp. 368–369, 1945.

During the last four years the gall disease of *Gypsophila paniculata* (*Phytomonas* [*Pseudomonas*] *gypsophilae*) [*R.A.M.*, xiii, p. 772] has caused heavy damage on newly grafted plants. The soft, nodular excrescences, up to 4 cm. in diameter, develop mainly on the upper cut surface of the rootstocks in the region of insertion of the scion, impeding the union of the two elements of the graft and causing the death of plants within a month. Of the various plant-protectives tested for the control of the pathogen, calcium hypochlorite proved the most effective, 97·6 to 100 per cent. of the grafts immersed for two to three minutes in a solution of 2 to 6 oz. per gal. remaining healthy compared with 4 to 60 per cent. of the untreated.

JENKINS (W. A.). **A Cercospora leafspot of cultivated Physostegia.**—*Phytopathology*, xxxv, 5, pp. 324–331, 2 figs., 1945.

A destructive leaf spot of *Physostegia virginiana* occurred over a restricted area in Virginia in 1943, and Dr. B. B. Higgins reports that the same disease was present in Georgia in 1941. The symptoms first appear in the latter part of June, but are scarcely perceptible before the end of July and do not assume an epidemic form until August. Pale yellow with dark centres at first, the lesions develop through shades of brick-red to a final pale to dark brown, frequently enlarging to cover most of the leaf blade.

The pathogen produced a *Cercospora* regarded by Professor Chupp as new and labelled by him (in herb.) *C. physostegiae*, besides typical *Mycosphaerella* spermogonia and perithecia. Cultures from conidia and ascospores were identical in all measurable respects. The perfect state, designated *M. physostegiae* n. sp., is characterized by innate-erumpent, ovate to subglobose, black perithecia, 47 to 95 by 40 to 75 μ, with a papillate ostiole at maturity; clavate, short-stipitate, fasciculate, aparaphysate, bitunicate asci, 36 to 40 by 10 to 20 μ, containing eight bicellular, straight to slightly curved, hyaline to subhyaline, guttulate ascospores, 11·6 to 17·8 by 2 to 3·8 μ; innate-erumpent, ovate to globose, black, ostiolate spermogonia, 27 to 60 by 27 to 56 μ; rod-shaped, hyaline spermatia, 1·5 to 4 by 0·5 to 0·8 μ, arising endogenously and liberated through sterigma-like processes; fasciculate, geniculate, basally pigmented, continuous or uni- to pluriseptate, mostly

short conidiophores; and hyaline to subhyaline, cylindrical-clavate, curved, uni- to sexseptate, guttulate conidia, obtuse at the basal end, tapering to subacute at the distal, 17 to 112 by 2·28 to 6·08 (mostly 48 to 60 by 3·8 to 4·2) μ.

It would appear from one season's observations that *M. physostegiae* is controllable by the removal and burning of the shed foliage any time between leaf fall and the following mid-April.

FISCHER (G. W.). **The stem smuts of Stipa and Oryzopsis in North America.**—*Butler Univ. bot. Stud.*, vii, pp. 25–39, 6 figs., 1945.

After pointing out that over much of the 'Western Range', comprising 728,000,000 acres, species of *Stipa* and *Oryzopsis* are prominent members of the grass cover and are commonly affected with stem smut, 15 to 20 per cent. of the plants being frequently, and 90 per cent. occasionally, attacked, the author states that a study of the identity of these smuts revealed the fact that for over 80 years stem smuts of *Stipa* and *Oryzopsis* have been collected in the United States under the name *Ustilago hypodytes* [*R.A.M.*, xxii, pp. 240, 361], whereas in point of fact six distinct species and one variety in two genera are actually represented. These fungi (a key to which is given) are *U. minima*, *U. nummularia*, *U. spegazzinii* and its var. *agrestis* (both on *Stipa* spp. only), *U. williamsii*, *U. jacksonii* (on *S. lettermani* only), and *U. fraserii* (on *S.* spp. only).

Preliminary work on the pathological histology of these smuts showed that with all the species except *U. fraserii* and *U. minima* the smut appeared to be entirely superficial.

No trace whatever was found of any stroma between the chlamydospore mass and the host epidermis, as described by Elisa Hirschhorn for some of these smuts on *Stipa* in Argentina [cf. ibid., xix, p. 710].

FISCHER (G. W.) & HIRSCHHORN (ELISA). **A critical study of some species of Ustilago causing stem smut on various grasses.**—*Mycologia*, xxxvii, 2, pp. 236–266, 6 figs., 1945.

During a study of the stem rusts of *Stipa* and *Oryzopsis* [see preceding abstract] it was discovered that the binomial *Ustilago hypodytes* has for many years been applied to a complex of smut fungi rather than to one species. From the study of hundreds of herbarium specimens from North and South America, Europe, Asia, and Africa, most of which were identified as *U. hypodytes* by prominent mycologists, it is concluded that this complex embraces four species and one variety of smut fungi which are separable into two groups. In the first group, comprising *U. spegazzinii* and its var. *agrestis* (epispore finely papillose or minutely echinulate) and *U. williamsii* (epispore smooth) the spores possess bipolar areas or appendages while in the second, comprising *U. halophila* and *U. nummularia* the spores are smooth and lack bipolar areas or appendages.

For each of the above-mentioned fungi the authors give a description and details of spore germination, a list of its hosts, its geographical distribution, and a list of all the specimens examined.

STAPEL (C.). **Kløverens Skorpesvamp (Phyllachora trifolii) som Aarsag til dødelig Forgiftning af Heste.** [The Clover scab fungus (*Phyllachora trifolii*) as the cause of fatal poisoning of Horses.]—Reprinted from *Ugeskr. Landm.*, *1942*, 2 pp., 1 fig., 1942. [Received August, 1945.]

Outbreaks of clover scab [black blotch] (*Phyllachora* [*Cymadothea*] *trifolii*) [*R.A.M.*, xxi, p. 527] are stated to have been of rare occurrence in Denmark during the present century, though apparently general in former times, according to E. Rostrup (1901). In August, 1942, however, the writer observed a severe attack of the disease, and in this connexion attention is drawn to an alarming

report from Germany (*Z. PflKrankh.*, li, pp. 435–441, 1941) of mortality among farm horses from the consumption of infected clover (fresh and hay) [*R.A.M.*, xx, p. 583].

TOMKINS (R. G.). **Impregnated wraps for fruit.**—*Food Manuf.*, xx, 4, pp. 140–141, 1945.

The following conclusions as to the control of fruit decay by the use of impregnated wraps are reached on the basis of the author's experiments at the Low Temperature Station for Research in Biochemistry, University of Cambridge and Department of Scientific and Industrial Research, and of a survey of the relevant literature. Laboratory and commercial trials have clearly demonstrated that the decay of some kinds of stored fruits, notably citrus, is to some extent preventable by the application of wraps impregnated with certain volatile fungicides [*R.A.M.*, xiv, p. 321; xxiii, pp. 104, 252] causing no visible injury or taint, and that the incidence of rotting in eggs can be reduced by storage in similarly treated flats and fillers [ibid., xx, p. 465]. None of the substances so far found effective for the objects in view is altogether ideal, and their use at this stage would probably contravene the food regulations of Great Britain and other countries. The discovery of a material free from any of the present objections would be of great practical advantage.

WARD (K. M.). **The treatment of little-leaf of deciduous fruit trees.**—*Qd J. agric. Sci.*, i, 4, pp. 59–76, 6 figs., 1944.

During the past few years, little leaf [*R.A.M.*, xviii, p. 687] has become increasingly prevalent in a number of varieties of fruit trees in the Stanthorpe area of Queensland. Apples are more often affected than other deciduous fruits, but the condition is quite common on pears and stone fruits.

Experiments in apple orchards from 1937 to 1941 showed that a winter spray of a 5 or $2\frac{1}{2}$ per cent. solution of zinc sulphate in water gave a satisfactory response in a few months, though spring foliage sprays containing up to 2 per cent. of zinc sulphate had little or no immediate effect. Winter sprays also gave more enduring effects than spring ones. Broadcasting and ploughing-in 5 lb. zinc sulphate round an affected tree gave beneficial results in the second and third years after treatment. Tree injections were not satisfactory.

It is concluded that winter spraying is likely to give the best results, though in the early treatment of the disorder winter spraying in conjunction with soil treatment is probably advisable.

KEMP (H. K.) & BEARE (J. A.). **Black spot of Apple.**—*J. Dep. Agric. S. Aust.*, xlviii, 9, pp. 374–380, 12 figs., 1945.

Apple scab (*Venturia inaequalis*) causes considerable losses to growers in South Australia, especially in the cooler, wetter parts of the Adelaide Hill, where the best orchards are situated. Overwintering in the conidial phase on the dormant bud scales was not observed, and the critical period for control, therefore, is during ascospore discharge [*R.A.M.*, xix, p. 104], which was found to extend approximately from late August to mid-October, very few discharges occurring in August. In spray trials reasonable control was obtained on most varieties with sprays at the green-tip, pink, and petal-fall stages, the following schedule being found generally effective: at the green-tip stage Bordeaux mixture 6–4–40; at the pink stage, just before the blooms open, lime-sulphur 1 in 40 gals.; at the petal-fall stage, lime-sulphur 1 in 60–80 gals.

In wet districts two Bordeaux sprays applied at the early green-tip and closed- to open-cluster stages may be desirable, and lime-sulphur at approximately 1 gal. to 100 gals. water may be included in the first cover spray two weeks after petal-fall if the spring has been wet.

Singh (U. B.). **Leaf spot disease of Apple in Kumaun.**—*Indian Fmg*, v, 12, pp. 566–567, 1944.

Heavy damage is caused annually in the apple orchards of Kumaun, United Provinces, India, by the leaf spot due to *Phyllosticta pirina* [*Phoma prunicola*: *R.A.M.*, xvi, p. 106], which first appears at the end of June, reaches a climax in the middle of August, and continues until defoliation ensues in October. The infected fallen leaves give rise to perithecia (*Mycosphaerella* sp.) in the following summer, and these serve to perpetuate the fungus the next season. Inoculation experiments demonstrated the capacity of the pathogen to invade its host through both injured and intact leaf surfaces, the strain from apple being able to attack pear and vice versa. The incubation period of *P. prunicola* ranges from 9 to 12 days.

The disease may be effectively combated by one application of 2–10–40 Bordeaux mixture at the dormant, open-cluster, or petal-fall stage. The operation may be carried out with a 'Four Oaks' or bucket sprayer, the former costing Rs 120 and the latter Rs 20, and a pressure of 75 lb. per sq. in. should be maintained throughout.

Wilkinson (E. H.). **Perennial canker of Apple trees in England.**—*J. Pomol.*, xxi, 1–4, pp. 180–185, 2 pl., 1945.

In the autumn of 1941, apple branches showing severe die-back and canker were received by the author for examination. From both types of lesion, a fungus subsequently identified as *Gloeosporium* [*Neofabraea*] *perennans* [*R.A.M.*, xxiii, pp. 66, 444] was isolated. The name 'perennial canker' is used for the disease in the present paper to prevent confusion with the canker due to *Nectria galligena*. The writer suggests that the disease of the fruit caused by *Neofabraea perennans* should be called 'bitter rot' as it is impossible in this country to distinguish it from the bitter rot caused by *G. album* and *G. fructigenum* [*Glomerella cingulata*].

On branches the most serious aspect of the disease in England is the die-back that results from the invasion of summer pruning cuts. The lesions extend from ½ to 6 in. behind the cuts, deeper penetrations being usually found on older branches. The die-back rapidly spreads, causing longitudinal splitting and peeling of the bark, exposing the swollen, brown, cortical tissues. These dry out and turn black. The limit of the lesion is marked by a groove-like ring of callus, laid down by the end of November in most cases, but frequently delayed until spring. Cankers are formed by penetration of the fungus into all types of bark injuries, especially those due to woolly aphis [*Eriosoma lanigerum*], but they also arise by extension of die-back of a lateral branch into the stouter member bearing it. The cankers are elliptical, slightly sunken, and surrounded by a callus ring.

On the fruits the disease is essentially a storage rot, but it was identified once among lenticel rots of Allington Pippin before picking, in early October. In cold store it usually appears in November and December, when small, circular, flattened or concave lesions appear, each with a lenticel at the centre. This centre is, as a rule, pale brown and surrounded by a darker brown marginal zone, but lesions showing no colour zonation are often found on the coloured side of the fruits. Individual lesions seldom exceed 1¼ in. in diameter, and depth of penetration about equals half the surface diameter. Acervuli, originating under the skin, burst irregularly through it, and produce white masses of spores embedded in mucilage. Storage losses from the disease are slight. In 1937–8 and 1938–9 only 0·03 and 0·01 per cent., respectively, of numerous apples examined were found to be attacked. Recently, infections by *Neofabraea perennans* have occurred more frequently, the fungus having been isolated from fruits grown in Somerset, Warwickshire, Worcestershire, Cheshire, Kent, and Cambridgeshire.

Inoculation tests showed that the fungus penetrates bark only through injuries, but causes rot in apple fruits through lenticels or skin wounds. Pruning experi-

ments demonstrated that infection takes place through summer but not winter cuts. The disease is unlikely to make headway in orchards where only winter pruning is practised.

BEAKBANE (A. BERYL) & THOMPSON (ELEANOR C.). **Abnormal lignification in the wood of some Apple trees.**—*Nature, Lond.*, clvi, 3953, pp. 145–146, 2 figs., 1945.

The authors state that histological investigations at the East Malling Research Station of what is known as the 'rubbery wood' condition [*R.A.M.*, xxiv, pp. 22 and 153], observed in Lord Lambourne apple trees, show that the flexibility of the stems is associated with a lack of lignification of many of the xylem fibres and vessels. Lignification appeared to be normal in one-year-old lateral shoots from 'rubbery' branches, except for occasional small areas near the cambium. In older shoots, and in the main stems of one-year-old trees, most of the summer wood was unlignified, and even the spring wood was found to be unlignified in some very severely affected shoots more than two years old. This lack of lignification can be seen by the naked eye when a cross-section of the wood from a living branch is suitably stained. In the unlignified areas the walls of the vessels and fibres gave the usual staining reactions of cellulose. The vessels had irregularly shaped walls and some had collapsed altogether. The xylem fibres were more or less circular in section, with abnormally thick walls. In general, they resembled the description of the gelatinous fibres of tension wood (B. J. Rendle in *Trop. Woods*, lii, p. 11, 1937), but, contrary to these, they often passed round the whole stem. Miller's Seedling and Dartmouth Crab varieties, growing near affected Lambourne trees, showed a similar lack of lignification, as also did James Grieve.

ZELLER (S. M.) & SCHUH (J.). **Diseases and insect pests of cane fruits in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 418, 58 pp., 27 figs., 1944.

This paper deals with the following diseases of cane fruits in Oregon: cane gall (*Agrobacterium* [*Bacterium*] *rubi*), crown gall (*A.* [*Bact.*] *tumefaciens*), hairy root (*A.* [*Bact.*] *rhizogenes*), decline disease [raspberry decline virus: *R.A.M.*, xxii, p. 318], dwarf disease [ibid., xvii, p. 473; xx, p. 69], red raspberry mosaic [raspberry mosaic virus], leaf and cane spot (*Septoria rubi*), anthracnose (*Elsinoe veneta*), orange rust (*Gymnoconia interstitialis*), yellow rust (*Phragmidium rubi-idaei*), cane blight (*Leptosphaeria coniothyrium*) [*Coniothyrium fuckelii*], mildew (*Sphaerotheca humuli*), spur blight (*Didymella applanata*), *Verticillium* wilt (*V. albo-atrum*), mushroom root rot (*Armillaria mellea*), stamen blight (*Hapalosphaeria deformans*), and various fruit moulds. A control chart is appended.

SCHUH (J.) & ZELLER (S. M.). **Insect pests and diseases of Strawberry in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 419, 40 pp., 21 figs., 1944.

The authors describe the following diseases of strawberry in Oregon: the viruses crinkle, stunt, witches' broom, and yellows, leaf spot (*Mycosphaerella fragariae*), scorch and leaf blight caused, respectively, by *Diplocarpon earliana* and *Dendrophoma obscurans* [*R.A.M.*, xxiii, p. 378], mildew (*Sphaerotheca humuli*), *Armillaria* crown rot (*A. mellea*), red stele root rot (*Phytophthora fragariae*), root rots, believed to be caused in Oregon by *Rhizoctonia* and *Verticillium*, fruit rots, of which the most important is associated with *Botrytis* grey mould [*B. cinerea*], and a physiological disease, alkali yellows. A control chart is appended.

VARGHESE (M. K.). **Bunchy top disease of Plantains.**—*Indian Fmg*, vi, 5, pp. 239–240, 1945.

Bunchy top of plantains [*R.A.M.*, xx, p. 290], first reported from Kottayam, Travancore, about six months ago, now extends over the whole town, where almost every garden shows a few infected stools, while some small plantations have already been destroyed. The disease appears to have been present in the locality

for at least three years, though its seriousness was not at first recognized by the ryots. It has now been notified as a disease to which the provisions of the Travancore Plant Pests and Plant Diseases Act XII of 1904 apply. A special temporary staff has been appointed to deal with the situation, and most of the ryots are co-operating in the effort to bring the disease under control. The method adopted is to dig up infected roots, chop them up, and bury them in deep pits with 1 ft. of well-rammed earth on top.

HORSFALL (J. G.). **Quantitative bioassay of fungicides in the laboratory.**—*Bot. Rev.*, xi, 7, pp. 357–397, 1945.

The author reviews and critically evaluates the progress that has been made in devising laboratory techniques for the testing of fungicides. A bibliography of 125 titles is given, most of which have already been the subject of notice in this *Review*.

STAPEL (C.) & PETERSEN (H. I.). **Forsøg med Kobberoxyklorid ('Kobberkalk') og nogle andre Specialpraeparater til Bekaempelse af Svampesygdomme.** [Experiments with copper oxychloride ('copper-lime') and some other proprietary preparations for the control of fungous diseases.]—*Tidsskr. Planteavl*, xlvii, pp. 468–496, 1943.

In experiments from 1939 to 1942 to determine the value as plant-protectives of a number of (*a*) copper-free and (*b*) copper-containing substitutes for, or accessories to, Bordeaux mixture, apples in various parts of Denmark were treated against scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: see next abstract] with (*a*) pomarsol [*R.A.M.*, xxii, p. 314], an organic sulphur compound, 20 per cent. thiocarbamic acid derivative; sulsol (40 per cent. colloidal sulphur) [ibid., xiii, p. 745; xvi, p. 765; xvii, p. 689]; cosan (49·1 per cent. colloidal sulphur) [ibid., vi, p. 670]; and Bayer 1192a, a copper-free organic compound: (*b*) bouisol (15 per cent. metallic copper); cuprasol [see next abstract]; Bayer 2343, vitigran, and Bordola-copper lime (all consisting of copper oxychloride with 15 per cent. copper); copper-lime C 35b; and silisan A and B, alkaline copper silicates with 4 and 3·5 per cent. copper, respectively.

Pomarsol (0·75 per cent.) appreciably reduced the incidence of scab, though its action was less powerful than that of Bordeaux; it is, however, free from deleterious effects on the trees. Sulsol and bouisol were applied jointly in five trials at 0·5 per cent. each, with results generally comparable to those secured with pomarsol. Cuprasol was used in four tests at a dosage of 0·75 per cent. for pre- and 0·5 per cent. for the post-blossom sprays. Its efficacy was practically equivalent to that of Bordeaux, the percentages of foliar and fruit scab on Laxton's Superb, for example, being reduced from 66·8 and 60·7 to 38·2 and 15·5, respectively, by cuprasol compared with 42·2 and 16·5 for the standard treatment. A tendency to cause scorching, however, appeared in the later applications in 1942. Copper-lime C 35b was less effective than Bordeaux mixture, while silisan A and B combined and the latter alone caused such heavy damage as to preclude their further use. Vitigran at 1 per cent. approximated in efficacy to Bordeaux mixture; spray injury was virtually restricted to the later treatments, for which a milder fungicide should be substituted. Bordola copper-lime and Bayer 2343 were less effective than Bordeaux, besides causing injury. Bayer 1192a was also inferior to Bordeaux but was non-injurious. Cosan (0·1 per cent.) merits further trials as a post-blossom spray.

The following were tested against potato late blight (*Phytophthora infestans*) on the Majestic, King Edward, and Bintje varieties in 1941: Bordeaux mixture 2–1–100, vitigran 2 and 1 per cent., copper-lime Bayer 0·5 and 0·4 per cent., and silisan B 5 per cent. These preparations reduced the average amount of foliar blight from 4·1 to 1·8, 2·3, 2·5, 2·6, 2·7, and 3 per cent., respectively, and of tuber infection

from 8·5 to 1·8, 2·1, 3·8, 3·4, 3·4, and 3·5 per cent., respectively, while increasing the yield from 294 to 334, 317, 321, 321, 305, and 304 hectokg. per ha., respectively. In the 1942 tests on King Edward and Bintje, apart from Bordeaux mixture 2–1– and 1–1–100, egosan (copper oxychloride with 45 per cent. copper) 1 per cent., vitigran 2 per cent., and pioner 13 (copper oxychloride with 2·8 per cent. copper) 1 per cent. gave the best results, all reducing foliar blight from 4·2 to 2·5 per cent. Vitigran 2 per cent. gave the largest yield increase, which amounted to 388 hectokg. per ha. as against 316 for the control plots, and 384 for Bordeaux 2–1–100 and pioner 0·6 per cent. Two dusts, Dana Bordeaux and Dana potato, the latter a copper oxychloride preparation with 7·2 per cent. copper, applied three times, each at the rate of 40 kg. per ha., gave 2·7 and 2·6 per cent. foliar blight compared with 2·1 per cent. for Bordeaux (two 2 per cent. sprays) and 4·1 per cent. for the control.

STAPEL (C.) & PETERSEN (H. I.). **Afprøvning af kemiske bekaempelsesmidler mod plantesygdomme og skadedyr.** [Testing of chemical remedies against plant diseases and pests.]—*Tidsskr. Planteavl*, xlviii, pp. 631–654, 1944.

The excellent results secured in experiments in 1943 with the standard spray schedule (first treatment 1–1–100 Bordeaux mixture, second and third 2 in 100 lime-sulphur, remainder white Bordeaux ½–1–100) in apple scab (*Fusicladium*) [*Venturia inaequalis*] control [see preceding abstract] point to its use wherever practicable, except on such copper-sensitive varieties as Beauty of Boskoop and Golden Delicious. Cuprasol, an arsenic-copper oxychloride mixture, 13 to 14:19 or 14·5:8·6 per cent., the former applied at the rate of (*a*) 0·75 per cent. before and 0·5 per cent. after blooming, and the latter at (*b*) 1 and 0·75 per cent., respectively, was similarly effective against the disease, but caused even more severe damage to the leaves and fruits. The use of this preparation should be restricted to pre-blossom treatments and a milder one substituted for the later applications. Colloidal sulphur X, cosan, and agrosol, containing 54, 50, and 40 per cent. sulphur, respectively, are less powerful fungicides than the foregoing, but may find a use on copper-sensitive varieties if preceded by stronger pre-blossom treatments and applied once or twice extra in the late summer.

List of common British plant diseases (compiled by the Plant Pathology Committee of the British Mycological Society).—61 pp., Cambridge University Press, 1944. 5*s*.

Developments in the study of pathology, taxonomy, and nomenclature since the publication of the second List of Common Names of British Plant Diseases [*R.A.M.*, xiv, p. 325] and the ensuing explanatory articles in the British Mycological Society's Transactions [ibid., xv, p. 467; xviii, p. 754] have necessitated revision and amplification, and at the same time the opportunity was taken to remodel the list. The scientific names of the parasites having proved to be at least as useful as the names of the diseases, the title has been changed. Furthermore, the host plants, now arranged in one alphabetical series, include a preliminary list of trees.

The scientific names of the parasites have again been carefully scrutinized, and some minor alterations necessitated by the adoption of certain general principles have been made. For instance, on reconsideration it is concluded that the Rule that nomenclature starts with the perfect state of a fungus was probably not intended to apply to the Phycomycetes, and since its use in connexion with this group has proved quite impracticable, attempts to uphold it have been abandoned. Further, to avoid several unacceptable changes in the scientific names of common rusts, advantage has been taken of J. C. Arthur's interpretation that the transfer of *Uredo* names is valid. A third modification consists in the use of the conidial name for the majority of fungi of which the perfect state has not been recorded from Britain.

As regards bacterial names, Dowson's system [ibid., xxi, p. 364] has been followed, partly because his conception of the genera *Pseudomonas* and *Xanthomonas* has already been widely accepted in this country and in America. Under this scheme of classification *Bacterium* is used as a generic name and the *Erwinia* combinations are given as synonyms whenever possible.

In view of the alphabetical arrangement of the hosts, the index of their common names has been omitted, but the list of authors' names and abbreviations is retained and a new index has been added, comprising the scientific names of the hosts and parasites and well-known synonyms. An index of the foreign common names is also included.

GARRISON (E. R.). **Sources of Oospora lactis on dairy farms.**—*Res. Bull. Mo. agric. Exp. Sta.* 388, 15 pp., 1945.

Sources of the common milk and cream contaminant, *Oospora lactis* [*R.A.M.*, xxiv, p. 282] on Missouri dairy farms were found to include barn dust (especially that raised by grooming the cows); milk equipment (80·6 per cent. of 36 separators, 76·7 per cent. of 60 milk pails, and 65·2 per cent. of 23 strainers); dry feeds (50 per cent. of 50 concentrate mixtures, 17 per cent. of 188 individual concentrates, and 19·9 per cent. of 141 hay samples); silage (especially maize); cow manure (the major source of infection on dairy farms); field and garden soils (28·8 per cent. of 52 and 46·4 per cent. of 28 samples, respectively); and cistern water (29·8 per cent. of 84 samples).

MEYER (J. R.). **Ação bacteriostática de um cogumelo macroscópico pertencente à família das Poriporaceas 'Polyporus cinnabarinus (Jacq.) Fries'.** [Bacteriostatic action of a macroscopic fungus belonging to the family of the Polyporaceae '*Polyporus cinnabarinus* (Jacq.) Fries'.] —*Arq. Inst. biol. S. Paulo*, xv, pp. 27–36, 1944. [English summary.]

In a further study on the bacteriostatic action exerted by extracts of *Polyporus cinnabarinus* [*R.A.M.*, xxiii, p. 493] the author showed this to be limited by the following factors: density of the bacterial suspension, thickness of the agar layer, hydrogen-ion concentration of the fungal extract, and the incubation period of the cultures.

SCHATZ (A.) & WAKSMAN (S. A.). **Strain specificity and production of antibiotic substances. IV. Variations among Actinomycetes, with special reference to Actinomyces griseus.**—*Proc. Nat. Acad. Sci., Wash.*, xxxi, 5, pp. 129–137, 1945.

A strain of *Actinomyces griseus*, characteristically producing streptomycin, gave rise to variants producing no aerial mycelium and no streptomycin and showing other properties distinct from the parent strain. Sporulating and streptomycin-producing strains, comparable to the original, were isolated, however, from the non-sporulating variants. The original strain had all the properties of *Streptomyces* [*R.A.M.*, xxiii, p. 150], whereas the inactive variant could be classified within the genus *Nocardia* [ibid., xiii, p. 259; xvi, p. 316]. The authors, therefore, raise the question as to what extent many of the species of *Nocardia*, isolated from natural substrates, represent variants of *Streptomyces* spp. which have lost the capacity of producing aerial mycelium.

WAKSMAN (S. A.). **Microbial antagonisms and antibiotic substances.**—ix. + 350 pp., 1 pl., 17 figs., 3 diags., 14 graphs, New York, The Commonwealth Fund, $3.75. London, Oxford University Press, 1945. £1. 2*s*.

The author describes this treatise as an attempt 'to present the broad interrelationships among micro-organisms living in association, either in simple mixed cultures or in complex natural populations, with special attention to the antagonistic effects'. Among the aspects of mycological or phytopathological interest

referred to may be mentioned Actinomycetes and fungi as antagonists, the chemical nature of antibiotic substances, and the microbiological control of soil-borne diseases. A bibliography of 1,016 titles is appended.

LEE (S. W.), FOLEY (E. J.), & CALEY (E. R.). **'Fissibactericidal' nature of penicillin action.**—*Nature, Lond.*, clvi, 3950, p. 49, 1945.

The authors consider that a new word is required to describe the particular kind of bactericidal action exemplified by the action of penicillin on susceptible organisms (e.g., *Staphylococcus aureus*) and connoting an agent toxic to bacteria only when they are growing or dividing. The term 'fissibactericide' is tentatively suggested.

BRIAN (P. W.) & MCGOWAN (J. C.). **Viridin: a highly fungistatic substance produced by Trichoderma viride.**—*Nature, Lond.*, clvi, 3953, pp. 144–145, 1945.

The authors describe a fungistatic substance, produced from several strains of *Trichoderma viride* [cf. *R.A.M.*, xxiv, p. 68], which they propose to name 'viridin'. The least concentration of the new substance required to prevent germination of *Botrytis allii* conidia was 0·005 μgm. per ml. as against 3·0 of gliotoxin, 0·5 mercuric chloride, and 0·025 di(ethylmercuri) hydrogen phosphate. This high sensitivity to viridin extends also to *Fusarium* spp., *Trichothecium roseum*, and *Cephalosporium* spp., whereas a number of species of *Penicillium* and *Aspergillus* require concentrations of 3 to 6 μgm. per ml. to prevent germination. Viridin does not appear to be markedly bacteriostatic.

FISCHER (A. M.). **Food yeast—a source of protein and vitamins.**—*Brew. Dig.*, xx, 2, pp. 39–41, 46, 3 figs., 1945.

Full details are given of the author's process for the production of a highly nutritious protein- and vitamin B-containing preparation with the aid of *Torulopsis utilis* var. *major* [*R.A.M.*, xxiii, p. 72] from blackstrap molasses [cf. ibid., xxiv, p. 282].

WESTON (W. H.). **Problems in the nature and control of tropical deterioration.**—*Amer. Dyest. Reptr*, xxxiv, 5, pp. P 91–P 93, 1945.

This general survey of the problems connected with the fungal deterioration of textiles and its control in the South and South-west Pacific theatres of war [*R.A.M.*, xxii, p. 479 *et passim*], presented at the annual meeting of the American Association of Textile Chemists and Colorists, Atlantic City, New Jersey, on 14th October, 1944, was followed (pp. P 93–P 95) by a discussion.

HOPLEY (M.) & JACKSON (J. R. F.). **Proofing textiles against rot, mould and mildew.**—*Text. Rec.*, lxiii, 749, pp. 41–42, 59, 1945.

Shirlan (salicylanilide), developed by the British Cotton Industry Research Association [*R.A.M.*, x, p. 598], is an extremely effective anti-mildew agent for cotton, linen, and woollen textiles, being colourless, odourless, non-volatile, and non-toxic. Among potential alternatives to shirlan, thallium carbonate is perhaps the best, but its cost is prohibitive for mildew-proofing. The chlorinated phenols are too volatile to afford more than temporary protection, while the nitrophenols turn the fibre yellow; both groups, moreover, are toxic and liable to cause dermatitis. Organo-mercurials are unstable in the presence of other metals and therefore ill adapted to application on ordinary textile machinery, while their fungicidal activity is also reported to be inhibited by contact with certain sulphur compounds. Other mildew-proofing substances beginning to find favour include Product VF (mercapto-benzthiazole) and 2:2′-dichloro-5:5′-dihydroxydiphenylmethane, but they seem unlikely to displace shirlan to any great extent at the moment.

Rot-proofing processes based on chromium are highly resistant to weathering. The simplest form of chromium treatment is the so-called 'chrome tinting',

involving impregnation with basic chromium sulphate or acetate, followed by after-treatment with alkali, and sometimes with copper sulphate. The resistance of chrome-tinted cotton to micro-organisms is comparable to that of ordinary mineral khaki-dyed material.

Copper rot-proofing methods in current use consist of treatment with cuprammonium hydroxide, copper carbonate, or copper soaps, of which the last-named, especially the naphthenates, are more resistant to the leaching action of rainfall than the other two. The chief disadvantage of the copper soaps is their adverse effect on the 'handle' of the fabric and, in the case of copper naphthenate, the characteristic odour they impart. Copper carbonate is possibly the simplest of the three compounds to apply, either by (*a*) impregnating the cloth with copper sulphate and then fixing the copper as its basic carbonate by after-treatment with soda ash, or (*b*) direct addition of a soda ash to a copper sulphate solution to produce a copper carbonate suspension for the impregnating liquor. After impregnation with cuprammonium hydroxide, the fabric is dried to drive off ammonia and reprecipitate the copper as its hydroxide. Duck cloths and canvases treated by this method are rot- and weather-resistant, but difficulties of preparation limit its use.

Marsh (P. B.), Greathouse (G. A.), Butler (Mary L.), & Bollenbacher (Katharina). **Testing fabrics for resistance to mildew and rot.**—*Tech. Bull. U.S. Dep. Agric.* 892, 22 pp., 1 fig., 1 diag., 1945.

A simple apparatus is described for the exposure of mildew-proofed fabrics to water-leaching under controlled conditions [cf. *R.A.M.*, xxiv, p. 281].

Several fungi, including a species of *Trichoderma*, have been found capable of tendering treated fabric of a higher copper content than that attacked in similar trials by the common test organisms, *Chaetomium globosum* [ibid., xxiv, p. 330] and *Metarrhizium* [? *glutinosum*: ibid., xxiii, p. 494; xxiv, p. 380]. *C. globosum*, however, appears to be the most satisfactory organism for use in tests on non-sterile fabric. Steam sterilization of material containing common organic preservatives, viz., pentachlorophenol, salicylanilide, 2,2′-dihydroxy-5,5′-dichloro diphenylmethane, and tetrabrom-o-cresol, decreased resistance to the last-named fungus in a number of instances even when applied for as short a period as 15 minutes at 15 lb. pressure.

A culture procedure is described in which the test fabric is planted on a mat of mycelium growing on a filter-paper strip supported on a salt agar medium. Used in this way, *C. globosum* attacked treated materials much more severely than when applied by the pipette-inoculum method. The presence of independently nourished mycelial inoculum, capable of repeated infection of the strip at many points, is believed to simulate in part the highly exacting conditions of soil burial.

In connexion with the capacity of the bottles used in the tests, the question arose of the quantity of air space necessary inside the container to provide sufficient oxygen for fungus growth and complete breakdown of the fabric. Neither *M.* [? *glutinosum*], *C. globosum*, nor *Stemphylium* sp. effected total disintegration of 8-oz. cotton duck in 500-c.c. bottles, while the quart-size air space was adequate for the two first-named but not for *S.* sp.

Of a number of preservatives tested, 2,2′-dihydroxy-5,5′-dichloro diphenylmethane was shown to possess exceptional fungicidal properties, while copper naphthenate [ibid., xxiv, p. 380] has proved consistently more effective per unit weight on fabric than various other copper compounds used in the experiments.

Lin (C. K.). **Nutrient requirements in the germination of the conidia of Glomerella cingulata.**—*Amer. J. Bot.*, xxxii, 6, pp. 296–298, 1945.

The author found the conidia of *Glomerella cingulata* so lacking in carbon and other foods as to be unable to initiate even the earliest stage of growth, and it

was only after several experiments that complete normal germination was achieved by means of a solution containing small quantities of dextrose, ammonium nitrate, monopotassium phosphate, and magnesium sulphate. This behaviour is in marked contrast with that of *Sclerotinia fructicola*, which has already been shown [*R.A.M.*, xx, p. 414] to require nothing but an energy material for germination.

In the case of *G. cingulata*, the elements carbon, magnesium, nitrogen, phosphorus, and sulphur have been proved to be indispensable, and the minimum requirement of nitrogen and phosphorus was found to be about 10^{-4} γ per spore. Potassium has not been demonstrated to be indispensable and there was nothing to show that an external supply of any organic substances is required, other than sugar. This is believed to be the first report of mineral nutrition in the germination of fungus spores.

GASTAUD (J. M.). **Étude histochimique du pigment colorant Sphaerotheca humuli (D.C.) Burr.** [A histochemical study of the pigment colouring *Sphaerotheca humuli* (D.C.) Burr.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 39–45, 3 figs., 1944.

A histochemical study [by methods which are described] of the pigment producing the black coloration of the perithecia of *Sphaerotheca humuli* showed the presence of melanin.

EDMUNDSON (W. C.), LANDIS (B. J.), & SCHAAL (L. A.). **Potato production in the western States.** Revised.—*Fmrs' Bull. U.S. Dep. Agric.* 1843, 58 pp., 45 figs., 1945.

Included in this bulletin, first published in 1940, are sections on potato seed-tuber certification and disinfectant treatment; the virus, non-parasitic, fungal, and bacterial diseases of special importance on crops grown under the semi-arid conditions of the western United States; spraying, dusting, and the selection of resistant varieties.

Potato haulm killing with T.A.C. compounds.—*J. Minist. Agric.*, lii, 5, pp. 215–217, 1945.

The results of trials carried out under the supervision of the technical officers of the War Agricultural Executive Committees and others suggest that for the killing of potato haulm against blight [*Phytophthora infestans*], although T.A.C. sprays were shown to be 10 per cent. less efficient than sulphuric acid, they are still efficient for the purpose and are more satisfactory to the small grower. At present the T.A.C. sprays, which are being produced for experimental purposes only, cost nearly four times as much as sulphuric acid—about £2 per acre for material; yet some growers, who dislike sulphuric acid, use sprays equally or even more expensive. If further results are satisfactory, the manufacturers hope to reduce the price. An improved type of T.A.C., 36c, which has little effect on the skin, mixes more readily with water, and gives a rather better haulm kill than T.A.C. 2, has been developed for testing.

SAMUEL (G.). **Guard against Potato blight.**—*J. Minist. Agric.*, lii, 4, pp. 159–161, 1945.

The continuous substantial losses of potatoes due to blight [*Phytophthora infestans*] in England, except during the driest years, has induced the author [*R.A.M.*, xxiii, p. 496] to emphasize the necessity of the wider adoption of control measures, namely good earthing-up to protect the tubers in the soil, spraying with Bordeaux mixture (4-5 hydrated lime—40), the first application being made before there is any sign of blight, the second three or four weeks after the first, and a third in wet seasons if blight is severe; and destruction of the haulm before lifting. Two sprayings (or six dustings in Lincolnshire) may increase the yield by 1 to 3 tons or more per acre. Clamp sites should be cleared up thoroughly as soon as riddling is finished.

NANDI (H. K.). **Potato in Assam.**—*Indian Fmg*, v, 12, pp. 551–554, 3 figs., 1945.

The most virulent potato disease in Assam, especially in the Khasi Hills, is late blight (*Phytophthora infestans*), early blight (*Alternaria solani*) being more common in the plains. Scab (*Actinomyces scabies*) is widespread and occasionally serious, while the very prevalent ring disease (*Bacillus* [*Xanthomonas*] *solanacearum*) is responsible for heavy losses of stored tubers in the plains from June to August.

FAGUNDES (N. B.). **Cancro da Batata-Synchytrium endobioticum (Schilb.) Perc.** [Potato wart—*Synchytrium endobioticum* (Schilb.) Perc.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 1, pp. 37–41, 2 figs., 1944.

This is a summary of the available information concerning the nomenclature, geographical distribution, host range, symptoms and effects, etiology, and control of potato wart (*Synchytrium endobioticum*).

Peru is the only South American country from which the disease has as yet been reported [*R.A.M.*, xxiii, p. 316; cf. also xiii, p. 291].

NOBREGA (N. R.) & SILBERSCHMIDT (K.). **Sôbre uma provável variante do virus 'Y' da Batatinha (Solanum virus 2, Orton) que tem a peculiaridade de provocar necroses em plantas de Fumo.** [On a probable variant of Potato virus Y (*Solanum* virus 2, Orton) which has the property of inducing necroses in Tobacco plants.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 307–330, 3 pl., 1944. [English summary.]

Further studies are described on a virus disease of the Peruvian Serrana Negra potato variety [*R.A.M.*, xxi, p. 94] herein designated 'vein necrosis', the most distinctive property of which is its capacity to induce severe necrosis on healthy tobacco plants a week to a fortnight after inoculation. At first the symptoms are virtually confined to the smaller veinlets, but at a later stage the plants become very stunted. The reactions of the White Burley variety to the virus were particularly marked.

From infected tobacco plants vein necrosis was transmitted by sap inoculation to the White Burley, Havana, and Geudertheimer tobacco varieties, *Nicotiana glutinosa*, *N. langsdorffii*, and *N. longiflora*, and possibly to *Petunia* sp. and Marglobe tomato, on which the symptoms were doubtful. Most of these plants are known to be susceptible to virus Y. On the other hand, *Datura stramonium*, which is immune from the latter, likewise withstood infection by the vein-necrosis virus. The disease was further conveyed by the aphids *Myzus persicae* and *Macrosiphum solanifolii* to healthy White Burley tobacco plants, which developed the typical symptoms of vein necrosis.

The physical properties of the Peruvian potato virus were shown by *in vitro* tests to resemble in some degree those of the Y group. The former succumbed to a temperature of 58° C., lost its infectivity in dilutions above 1 in 1,000, retained its activity for seven days, survived for $2\frac{1}{2}$ hours in the presence of 50 per cent. alcohol, and was destroyed by desiccation. The writers conclude that the virus is a variant of the potato virus Y group with a special tendency to the production of necrotic symptoms on tobacco.

SPRINGER (MARTHA E.). **A morphologic study of the genus Monoblepharella.**—*Amer. J. Bot.*, xxxii, 5, pp. 259–269, 46 figs., 1 diag., 1945.

A full account is given of a study made of 11 isolates of *Monoblepharella* found in tropical and semi-tropical soils, including a detailed description of the development and morphology of *M. taylori* [*R.A.M.*, xxiv, p. 389]. The main characteristics of *M. elongata*, *M. mexicana*, and *M. laruei* are indicated, and the paper terminates with a comparison of the genera *Monoblepharella* and *Monoblepharis*.

LUNDBLAD (K.). **Bristsjukdomar hos odlade växter.** [Deficiency diseases of cultivated crops.]—23 pp., 4 figs., Stockholm, Statens Livsmedelskommission, 1945.

In this account of trace element deficiencies in crop plants, beet heart rot, due to lack of boron, manganese deficiency of oats and numerous other plants, and copper deficiency of oats, wheat, barley, timothy [*Phleum pratense*], and other crops are stated to occur in Sweden. Directions are given for the detection and control of such deficiencies.

REINKING (O. A.). **Report on Cinchona diseases in Guatemala.**—*Plant Dis. Reptr*, xxix, 17, pp. 432–439, 1945. [Mimeographed.]

The author reports the results of a rapid survey of *Cinchona* plantings in Guatemala, made from 20th to 22nd January, 1943 [*R.A.M.*, xxiv, p. 119]. Damping-off of seedlings in seed-beds was not serious in well-managed plantings and was attributed to the ordinary damping-off fungi found in practically all tropical soils. A *Rhizoctonia* [ibid., xviii, p. 729] was isolated from affected plants and a *Pythium* reported to occur in diseased seed-beds. Post-emergence damping-off was severe in some beds and it was stated that a *Phytophthora* had been isolated from plants thus affected. Control was readily effected by Bordeaux mixture or yellow cuprocide. The fungus is regarded as capable of attacking any species of *Cinchona*. Die-back and stem canker of nursery stock was observed on *C. ledgeriana* and *C. calisaya*. The disease is characterized by the dying-back and blackening of the young growing tips of plants. A *Phytophthora* [ibid., xx, p. 8] isolated from such diseased nursery stock is regarded by A. Müller as the causal organism.

A serious stem and crown canker disease of older trees planted in the field was reported and attributed to incompatibility between *C. ledgeriana* and *C. succirubra* grafts producing weak plants subject to infection, although this combination has been practised for years in Java and elsewhere. It is suggested that a *Phytophthora* should be looked for as the parasite causing this disease, and that the *Nectria* frequently present on dead parts may be secondary. Further investigation is required of an apparent root rot present in some areas on certain strains of *Cinchona* of the *ledgeriana* narrow-leaf type. A. Müller has reported a *Rosellinia*-like fungus [ibid., xvi, p. 408] on the roots of dead trees on one of these plantations.

An unidentified leaf-spotting, of obscure etiology, but possibly nutritional in origin, was common on all three plantations visited. In the earliest stages the spotting is characterized by minute water-soaked spots, which become dark red-brown with sunken centres. The oldest spots show ashen-grey centres, with dark reddish-brown borders. The leaves may be wrinkled and in severe cases defoliation may occur. The disease has not caused any widespread damage, except in certain narrow-leaf *C. ledgeriana* strains. Some clones appear to show resistance. The disease requires investigation.

Other leaf diseases observed were sooty mould (*Capnodium* spp.), associated with a scale insect (*Saissetia hemisphaerica*); algal leaf-spot (*Cephaleuros virescens*); a marginal leaf scorch thought to be non-parasitic; a general leaf-reddening, often produced by abnormal weather conditions; a black-blotching of leaves covered with pumice from the active volcano Santa Maria, attributed to rubbing; and a leaf mottle or chlorosis believed to be nutritional.

ARRUDA (S. C.). **A 'escaldadura das fôlhas', doença da Cana de Açúcar, nova no Brasil.** ['Leaf scald', a Sugar-Cane disease new to Brazil.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 142–196, 5 pl., 1944. [English summary.]

Further information is presented concerning sugar-cane leaf scald (*Phytomonas* [*Xanthomonas*] *albilineans*) in São Paulo, Brazil [*R.A.M.*, xxiv, p. 338], where it

is stated to have been present since 1937, though the agent was not recognized until 1943 and the disease was originally designated 'albinism'. It is thought to have been introduced into the State from Australia between 1926 and 1930 on the N.G. 24 A, H.Q. 426, Badila, and Q. 13 varieties. Although not at present of great economic importance, the disease is potentially serious as attacking the early-maturing varieties essential for manufacturing purposes. Of 13 varieties tested for their reactions to the pathogen, P.O.J. 2725, C.P. 11/65, Co. 290, and U.S. 1694 were classed as resistant, P.O.J. 2878 and P.O.J. 100 as moderately resistant, C.P. 28/11, C.P. 29/320, Co. 281, and C.P. 27/139 as moderately susceptible, and C.P. 28/19, P.O.J. 213, and C.P. 28/60 as susceptible. P.O.J. 213, despite its susceptibility in these trials, has so far escaped infection in the field. The chronic form of leaf scald is more prevalent in São Paulo than the acute.

Diseased seed pieces and knife infection appear to be mainly responsible for the spread of the bacterium. Experimental inoculations demonstrated the pathogenicity of the juice extracted from the young leaves and spindle of canes with the latent form of the disease. Seed-cane selection and roguing of diseased stools are recommended as control measures, and a special system of indexing stools in the latent phase is proposed as a means of localizing infection.

MARTIN (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1943–4* (ex *Printed Reps. Hawaii Sug. Pl. Ass., 1944*), pp. 22–27, 1944.

The author [cf. *R.A.M.*, xxiii, p. 288] points out that, as a result of the establishment of airfields bordering plantations and of faster and more frequent trans-Pacific services between Hawaii and other countries, insect-carried diseases, such as Fiji disease, have a much better opportunity of propagation.

Plantation inspections showed that the rapid spread of 32–8560 [ibid., xxii, p. 344] has done much for disease control, particularly in the case of eye spot [*Helminthosporium sacchari*], areas seriously attacked formerly being now free. Growing of resistant varieties is responsible for the conspicuous absence of mosaic disease. Moderate to severe brown stripe disease [*H. stenospilum*] [ibid., xxiii, p. 288] was recorded on localized areas of plantations on windward Kaui island. Leaf scald [*Xanthomonas albilineans*] [loc. cit.] is still serious on parts of Hawaii, and chlorotic streak disease persists on low-lying fields [loc. cit.].

A local *Penicillium* species isolated from banana produces a high yield of penicillin by the submerged culture method, and it has been demonstrated that the strain of *Fusarium oxysporum* isolated from diseased prickly pear [ibid., xxiv, p. 109], inhibited the growth of *Staphylococcus aureus*.

A table shows the tolerance to local and foreign diseases of the 15 sugar-cane varieties occupying upwards of 1,000 acres in the territory.

The varieties 32–8560 and 32–1063 are the most widely cultivated, and are resistant to all local diseases.

Service and regulatory announcements, October–December, 1944.—Plant quarantine import restrictions, Republic of Peru.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, p. 103, 1945.

Supreme Decree No. 511 of 23rd September, 1943, as modified by Supreme Decree No. 612 of 15th December, 1943, introduces the following among other amendments to the Supreme Decree of 3rd June, 1942, regulating the importation of flax seed into Peru [cf. *R.A.M.*, xxi, p. 352]. The Directorate of Agriculture authorizes the importation, exclusively through the Society for the Encouragement of Flax Cultivation, of flax seed only from regions in which wilt (*Fusarium lini*) is absent, and subject to the accompaniment of the consignments by duly authenticated certificates vouching either for this condition or for the freedom from infection of the particular lots concerned.

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SILBERSCHMIDT (K.) & LOPEZ TORRES (H.). **Algumas observações sôbre o mecanismo da acumulação do 'Nicotiana virus 1 (Mayer) Allard' em folhas de Fumo.** [Some observations on the mechanism of the accumulation of '*Nicotiana* virus 1 (Mayer) Allard' in Tobacco leaves.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 97–140, 2 pls., 5 graphs, 1944. [English summary.]

Experiments to determine the possible influence of the concentration of the inoculum on the mode of increase of the tobacco mosaic virus in tobacco foliage and on the virulence of the resultant symptoms were performed, mostly by Rischkov's detached-leaf method [*R.A.M.*, xxiii, p. 81], mainly on the susceptible White Burley and resistant Palmira 12 varieties. In these tests the petiole was immersed in a small Petri dish containing water or a nutrient solution, while the leaf tip was supported by a cardboard holder. The opposite halves of the leaf blades were rubbed with infective juice, one half (A) at a dilution of 1 in 10 of the crude sap, and the other (B) at 1 in 10,000. The virulence of the saps (a) and (b) obtained from the halves (A) and (B) of successive leaf samples was tested by inoculations on *Nicotiana glutinosa*, using Youden and Beale's local-lesion method of estimation [ibid., xiv, p. 197].

Virus activity was found to increase, not continuously, but through a series of fluctuations, from the second day onwards, reaching a maximum about the 20th day after inoculation. The differences in virus activity between the (a) and (b) saps were particularly noticeable during the first fortnight after inoculation, but tended to diminish thenceforward, though even by the close of the experimental period they had not altogether disappeared, at any rate in the susceptible Havana and White Burley varieties. Neither the kind of nutrients supplied nor the variations in temperature occurring during the trials appeared to influence virus accumulation in the leaves. Corresponding to the increase of virus activity in plants inoculated with the higher concentration was an access of severity in the symptoms, which appears to substantiate the view expressed, e.g., by Kausche [ibid., xvi, p. 829], that the concentration of the infective principle bears a closer relation to its pathogenicity than has generally been admitted. The authors' observations point to caution in the acceptance of the theory of autocatalytic virus multiplication within the host irrespective of the amount of inoculum introduced.

ALCARAZ MIRA (E.). **Obtención de razas de Tabaco resistentes al mosaico ordinario.** [Development of Tobacco races resistant to ordinary mosaic.]—*Bol. Inst. Invest. agron., Madr., 1944*, 11, pp. 89–120, 18 figs, 1944. [French, English, and German summaries.]

Since 1933 hybridization experiments have been in progress at the Station of Tobacco Studies, Santiponce, Seville, with a view to the development of mosaic-resistant tobacco selections from crosses between the varieties cultivated in Spain, namely, Valencia, Kentucky, Filipino, Maryland, and Habano, and Nolla's highly resistant Ambalema [*R.A.M.*, xiv, p. 660]. The mode of procedure involved the production of several generations without selection, inoculation tests, separation

of the seed of resistant plants, and hothouse propagation of auxiliary generations to confirm the stability of immunity in the progeny of uninfected plants before pursuing the selection. Of the original three hybrids obtained, i.e., 60 (Ambalema × Filipino), 61 (Ambalema × Kentucky), and 57 (Ambalema × Valencia), the first-named was the most satisfactory both as regards resistance and leaf quality. Two recent selections, 230 (Hybrid 60 × Filipino) and 224 (Hybrid 60 × Hybrid 217) are superior to the foregoing in respect of foliar characters, but less resistant to mosaic.

WILLIAMS (R. C.) & WYCKOFF (R. W. G.). **Electron shadow micrography of the Tobacco mosaic virus protein.**—*Science*, N.S., ci, 2632, pp. 594–596, 3 figs., 1945.

The authors describe a method of electron micrography in which a thin film of gold is shadow-deposited on dried films of tobacco mosaic virus protein, the gold deposit being stripped off with the aid of collodion and photographed with the usual equipment of the electron microscope. The results show that the segmented rods or fibrils are about 125 Å in both height and width, the length of the segment being variable. The method can be used for viruses of much smaller particle size.

ALEXANDER (L. J.) & TUCKER (C. M.). **Physiological specialization in the Tomato wilt fungus Fusarium oxysporum f. lycopersici.**—*J. agric. Res.*, lxx, 9, pp. 303–313, 1 fig., 1945.

The authors describe experiments on testing resistance to tomato wilt (*Fusarium oxysporum* f. *lycopersici*) in Ohio, where a distinctive race of the pathogen has been isolated. Comparative studies of this race with isolates from Missouri [*R.A.M.*, xix, p. 501] and Washington were made with various tomato varieties, *Lycopersicon pimpinellifolium* (accession No. 160), and a number of *L. pimpinellifolium* × *L. esculentum* crosses and their progenies. In these trials, [the results of which are tabulated], all the commercial varieties of tomato tested (including varieties resistant to other races of the pathogen) proved susceptible to the Ohio race, but *L. pimpinellifolium* (No. 160) appeared to be segregating for resistance and susceptibility to this race. The Missouri and Washington isolates exhibited the same type of pathogenicity, although the latter consistently caused a few more plants to become diseased, and resistance to these races appeared to segregate according to a simple Mendelian ratio. The inheritance of resistance to the Ohio race is more complicated and appears to involve the gene for resistance to the Missouri race and an undetermined number of complementary genes.

GREEN (D. E.) & THOMAS (C. T.). **Note on blight of outdoor Tomatoes.**—*J. R. hort. Soc.*, lxx, 7, pp. 211–214, 1945.

In a small test at Neath, South Wales, in 1944 on the control of blight (*Phytophthora infestans*) on outdoor tomatoes [*R.A.M.*, xxiii, pp. 47, 462], Market Ring tomatoes interplanted with potatoes were sprayed with Bordeaux mixture (made from a proprietary paste) or a colloidal copper spray (the potatoes remaining untreated), each with added saponin, on various dates from 15th July to 27th August, plots 1 to 4 receiving one application, plots 5 to 7 two, plots 8 and 9 three, and plot 10 four. One plot remained unsprayed. In the Bordeaux plots the percentages of infection were, respectively, 18·1, 19·6, 17·5, 21·6, 35·6, 5·5, 10·9, 7·9, 6·9, 6·5, and (control) 61·5, while in the colloidal copper plots they were 30·3, 17·5, 8, 10·4, 9·6, 1·8, 2·3, 1·7, 1·1, 1·2, and (control) 36·8. These results show that in western England two sprayings are necessary as compared with only one in south-eastern districts, the most effective appearing to be those of 30th July and 12th August, possibly because infection developed rather late.

RHOADS (A. S.). **Some observations on diseases of woody plants in Florida.**—*Plant Dis. Reptr*, xxviii, 7, pp. 260–272, 1944. [Mimeographed.]

Root rot, caused by *Clitocybe tabescens* [*R.A.M.*, xxi, p. 497], was observed on a large tree of *Pinus glabra* in Alachua County, this being a new host record for that fungus.

Records of wood-rotting fungi on living trees in Florida include *Fomes geotropus* [ibid., xviii, p. 772], fruit bodies of which were found growing in the centres of open, circular, gnarly, gum-exuding lesions, about 9 ft. above the base of a *Magnolia grandiflora* tree, and also on a basal scar of a box elder (*Acer negundo*); *F. marmoratus*, fruiting on an old fire scar at the base of a laurel oak (*Quercus laurifolia*), and also on an apparently uninjured large pignut hickory (*Carya glabra* var. *megacarpa*); *Ganoderma curtisii* [? *G. lucidum*: ibid., x, p. 138] on *Persea humilis*; *G. sulcatum* on *Sabal palmetto*; *Polyporus fissilis* [ibid., xv, p. 470] on southern red oak (*Quercus rubra*); *P. gilvus* [ibid., vii, p. 753] on *Q. laevis*; and *P. sector*, *P. hispidus* [ibid., xviii, p. 83], and *P. sulphureus* on *Q. laurifolia*.

The galls of the southern fusiform rust (*Cronartium fusiforme*) [ibid., xx, p. 187] were found to be widespread in many counties of northern Florida, especially on *Pinus echinata* and frequently on *P. taeda*, but also occasionally on *P. caribaea*. The infection of young trees is often very severe, leading to deformation, and rendering them useless for timber production.

Leaf blight of mistletoe (*Phoradendron flavescens*), caused by *Sphaeropsis visci*, is stated to be of frequent and widespread occurrence in many parts of Florida, attacking stems as well as leaves, the fungus fruiting abundantly on the latter.

A number of fungi (chiefly *Septobasidium* spp.) are also recorded as parasitic on scale insects in the forests of north-central Florida.

TYLER (L. J.). **Influence of temperature on the Dutch Elm disease in potted American Elm.**—*Phytopathology*, xxxv, 5, pp. 302–304, 1945.

In the summers of 1940, 1941, and 1942, some 200 potted American elms, ranging in height from 2½ to 7 ft. and in age from three to four years, were inoculated with conidial suspensions of a virulent isolate of *Ceratostomella ulmi* 12 to 24 hours after, or in one case just before, their distribution in six temperature chambers, one group being set aside for outdoor growth. The temperature and relative humidity ranges in the six chambers and out-of-doors were (1) 9·5° to 12° C., 75 to 85 per cent.; (2) 15° to 16°, 80 to 94; (3) 18·5° to 21°, 76 to 85; (4) 12·5° to 20°, 62 to 100 (outside); (5) 21·5° to 25°, 61 to 78 (basement corridor); (6) 26° to 29°, 69 to 84; and (7) 32° to 37°, 66 to 79. The exposure periods varied between a week and a month.

The temperature range generally conducive to Dutch elm disease extended roughly from 15° to 29° [*R.A.M.*, xiii, p. 733]. Trees exposed to temperatures fluctuating between 26° and 29° developed 100 per cent. wilt in three to five days, and the amount of wood discoloration showed invasion by the pathogen to be quasi-complete. On the other hand, at 32° to 37° or at 9·5° to 12°, there was at least a fortnight's retardation or even inhibition of infection, while penetration was almost entirely suppressed. The transference of trees, after four days at 27°, to a chamber held at 10° resulted in two to five days' delay in the appearance of symptoms. Conversely, removal to a temperature of 27° after four days at ranges adverse to the pathogen expedited symptom expression by two to four days. When trees in an active state of terminal growth were transferred to the open after one to three weeks' exposure to temperatures unfavourable to the disease, e.g., 10° and 32° to 37°, they ultimately developed complete wilting and extensive fungal invasion. If, on the other hand, terminal growth had ceased before exposure to unfavourable temperatures, the wilt was definitely suppressed in some trees and failed to develop in others even on removal to the open. Fifteen hours' nocturnal

exposure (5 p.m. to 8 a.m.) at 32° to 37°, alternated with a daily nine-hour, outdoor daytime (8 a.m. to 5 p.m.) period at a range of 10° to 33° altogether inhibited the wilt, whereas the reverse treatment, i.e., indoors at high temperatures during the day and outdoors at lower ones at night, permitted complete wilting in 14 to 26 days. Inoculated controls kept constantly out-of-doors for the same period wilted entirely within a fortnight, while those maintained at 32° to 37° did not contract the disease but sustained severe foliar injury. Evidently, therefore, the pathogenicity of *C. ulmi* to potted elms may be modified to a considerable extent by temperature fluctuations.

TEHON (L. R.). **American Elms die by tens of thousands from phloem necrosis disease epidemic.**—*Greenk. Reptr*, xiii, 2, pp. 17–19, 3 figs., 1945.

During the summer of 1944, phloem necrosis destroyed tens of thousands of elms [*R.A.M.*, xxiv, p. 256] in West Virginia, Ohio, Indiana, Illinois, Missouri, Kansas, and as far south as Mississippi, and at present it is more to be feared in the Midwest than Dutch elm disease [*Ceratostomella ulmi*]. The total number of trees dying during the epidemic is not known, but it has been estimated that 10,000 were lost at Columbus, Ohio, and over 1,600 in the southern half of Illinois. Though first reported with certainty from Ohio in 1918, phloem necrosis may well have been responsible for a number of severe outbreaks of elm disease in Kentucky and Illinois between 1882 and 1918. Infected trees cannot be saved by any known treatment, but attempts are in progress to develop resistant varieties from the survivors of an epidemic that ravaged northern Kentucky during the 'nineties of last century.

KUHNHOLTZ-LORDAT (G.). **Le dépérissement des châtaigneraies cévenoles.** [Wilt of Chestnut groves in the Cevennes.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 32–34, 1944.

After referring to the great variability shown by the symptoms of chestnut ink disease, the author states that his observations on chestnut wilt in the Cevennes in 1942 convinced him that the reason for this variability is that chestnut roots may be destroyed by several factors, acting together or independently. The problem of chestnut wilt is not a simple one, due to ink disease alone, but a complex one made up of a number of factors. In his opinion, the wilt in the Cevennes may be due to *Armillaria mellea* [*R.A.M.*, iii, p. 8], causing root rot, *Phytophthora cambivora* [ibid., xxiii, pp. 156, 375], causing ink disease, root infestation by an unidentified insect causing 'fioc' or fire, and, possibly, various non-parasitic factors.

LONG (W. H.). **Notes on four eastern species of Gymnosporangium.**—*J. Wash. Acad. Sci.*, xxxv, 6, pp. 182–188, 2 figs., 1945.

This paper reports investigations conducted in 1912 and 1913 in the District of Columbia and vicinity on the occurrence on red cedar (*Juniperus virginiana*) of four species of *Gymnosporangium*, *G. clavipes*, *G. nidus-avis*, *G. effusum*, and *G. juniperi-virginianae*, to ascertain their prevalence and distribution, their action on the host and, if possible, the aecidial stage of *G. effusum*.

G. clavipes and *G. nidus-avis* were found widely distributed in the areas surveyed and *G. effusum* and *G. juniperi-virginianae* less so. *G. clavipes* was rarely abundant on trees with open tops or with lower limbs removed for half the distance up the tree, and it was not prevalent on solitary trees in the open with small branches down to the ground. Trees without trunk lesions of *G. clavipes* were seen to be comparatively unshaded and to have open foliage. This rust travelled more rapidly

laterally than longitudinally and did not kill the living bark even in the centre of the oldest and largest lesions on trunks and large branches, but killed small branches and twigs by girdling. All lesions found were on well-developed wood without needles. *G. clavipes*, a serious rust on certain varieties of apples, would prove a menace to apple culture during favourable years in this area.

The heavy infection by *G. nidus-avis* of cedars in the Arlington Cemetery and Great Falls, Virginia, districts was probably due to their considerable size and great age, and three types of lesions were produced, namely, trunk, branch, and broom. On cedars examined from the Washington area, teleutosori or lesions were confined to the limbs and branches with heartwood. The living bark down to the sapwood under and adjacent to the teleutosori was stained a golden-yellow during the maturation and gelatinization period. This was a very marked characteristic by means of which the infected area could often be determined even before the teleutosori were formed. This yellow colour was due to small, yellowish globules in the hyphae of the subhymenial layers. Many suppressed, but apparently mature, golden-yellow spores were present, but these were not the main cause of the yellow colour.

Lesions of *G. effusum* formed deep-seated, woody-corky, truncate, ridge-like galls, 2 to 6 mm. high and 3 to 12 mm. wide, running longitudinally in parallel rows on branches and trunks of the red cedar. When alive, they were composed of rather firm, cheese-like tissue filled with rich foodstuffs for the development of the teleutosori. After the teleutospores matured, the galls became brown, more or less suberized, and covered with a corky callus. After one, or possibly two, years of fruiting these galls died, but persisted for years on the old dead areas of the lesions.

The infection spread slowly transversely on branches and trunks and the new galls developed at irregular intervals next to and on the outside of the old ones and parallel to them. When expanded the teleutosori were wedge-shaped, 10 to 12 mm. high by 2 to 6 mm. thick at the top and 10 to 30 mm. long, and often fell away in a body, leaving a yellowish scar. Successive years of fruiting on twigs and branches finally killed the lesions by the complete destruction of the cortex, phloem, and cambium, the only *Gymnosporangium* known to do so. Very old lesions had a charred look like a fire scar.

G. juniperi-virginianae was only present to any appreciable extent in areas with young and small cedars.

The author considers that the aecidial host of *G. effusum* is probably one or more of the species of *Crataegus* listed for *G. hyalinum*.

VERRALL (A. F.). **The control of fungi in lumber during air-seasoning.**—*Bot. Rev.*, xi, 7, pp. 398–415, 1945.

A comprehensive and informative survey is made of the various accepted treatments for controlling fungi in timber, accompanied by a bibliography of 91 titles. As much as 3½ billion board feet of lumber annually are estimated to be dipped in chemicals for the prevention of fungus deterioration in seasoning yards [in the United States].

CHESTER (K. S.) & MCLAUGHLIN (J. H.). **Recognition and control of vegetable diseases.**—*Circ. Okla. agric. Exp. Sta. C* 117, 16 pp., 1 fig., 1945.

This circular gives directions in popular terms for the recognition of the common vegetable diseases in Oklahoma, shows how the losses they cause can be reduced, and indicates the principal disease-resistant vegetable varieties and the best seed treatment. A table is appended giving the methods of control of the various diseases.

STAPEL (C.). **Mosaiksyge paa Kaalroer, en ondartet, men upaaagtet Sygdom.** [Turnip mosaic disease, a virulent but unheeded disease.]—Reprinted from *Ugeskr. Landm., 1940*, 4 pp., 6 figs., 1940. [Received August, 1945.]

The turnip mosaic virus was responsible for heavy losses in several parts of Denmark in the autumn of 1939. Much of the damage formerly attributed to *Contarinia nasturtii* and *Brevicoryne brassicae* is believed to have been actually due to the mosaic virus, the symptoms caused by which are very similar in some respects to those due to the insect pests.

LEBEAU (F. J.) & WALKER (J. C.). **Turnip mosaic viruses.**—*J. agric. Res.*, lxx, 11, pp. 347–364, 8 figs., 1944.

In this study, four virus isolates from turnip were compared with one another and with previously described viruses from cruciferous plants [see next abstract].

One of the isolates (T8) corresponds closely in properties and host range with the strain of turnip virus 1 [turnip mosaic virus] described in a forthcoming publication in *J. agric. Res.* as cabbage virus A [loc. cit.], and with the black ring [*R.A.M.*, xvii, p. 151] and ring necrosis [ibid., xx, p. 507] viruses from cabbage; these viruses differ chiefly in their effects upon the host plants. The other three isolates, T1, T6, and T9 are similar to T8 in properties and breadth of host range, but differ from each other and from T8 in rather important host selectivity and in symptomatology on certain common hosts. None of the last three infects cabbage, cauliflower, kale, Brussels sprouts, or annual stock [*Matthiola incana* var. *annua*], though all infect green sprouting broccoli and only T9 infects kohlrabi and dame's violet [*Hesperis matronalis*].

T8 and T9 infect all the species of *Nicotiana* tested and T6 all except *N. rustica*, but T1 failed to infect tobacco, *N. rustica*, *N. repanda*, or *N. sylvestris*. On *Zinnia*, the symptoms induced by T1 consisted of mild, localized necrosis and those by T6, T8, and T9 of severe, coarse mottle with stunting.

All the viruses so far fully described from crucifers are infectious to turnip. The four isolates described here, however, differ in one point or another from all previously described viruses and from each other, but they are considered sufficiently similar to the turnip mosaic virus to be regarded as strains of it and as distinct from the cauliflower mosaic virus group.

WALKER (J. C.), LEBEAU (F. J.), & POUND (G. S.). **Viruses associated with Cabbage mosaic.**—*J. agric. Res.*, lxx, 12, pp. 379–404, 6 figs., 1945.

The authors describe two distinct viruses, tentatively designated cabbage viruses 'A' and 'B', found in cabbage plants affected with mosaic [*R.A.M.*, xix, p. 65] in the Middle West and in western Washington. In the original study of cabbage mosaic the virus agent was found to have a wide host range. On tobacco only local lesions were produced, and when the virus extract was heated to several degrees higher than 55° C. the symptoms induced on cabbage differed from those of the original extract. This virus was named 'B'. When sap of non-cruciferous plants inoculated with cabbage mosaic extract was used for inoculating cabbage the symptoms differed in certain respects and the virus thus obtained was termed 'A'. Cabbage virus A was favoured by relatively high air temperatures and B by low ones. Virus A has a shorter incubation period than B by several days and usually first caused a mottle at 28° C., whereas B usually caused vein-clearing and a mild diffuse mottle. Cauliflower mosaic virus causes a more severe disease reaction in cauliflower than in cabbage, while the reverse is true in the case of cabbage virus B. Cabbage virus A causes typically chlorotic and mottle effects and the black ring virus produces dark green rather than chlorotic rings and necrotic ring spots. Cabbage virus A and the black ring virus are closely related to the turnip virus described by Hoggan and Johnson [ibid., xiv, p. 731], from which the

cauliflower mosaic virus is quite distinct. The ring-necrosis virus of Larson and Walker [ibid., xx, p. 507] has a similar host range, although the properties reported are different. Cabbage virus B is regarded as a strain of the cauliflower virus and related to the virus from broccoli described in southern England by Caldwell and Prentice [ibid., xxii, p. 122].

The authors conclude that cabbage virus A, the cabbage black ring virus, and the cabbage ring-necrosis virus may be regarded as strains of turnip virus 1 [turnip mosaic virus], and that the cauliflower mosaic virus as described by Tompkins should be designated as cauliflower virus 1 [cauliflower mosaic virus], of which cabbage virus B and the broccoli virus of Caldwell and Prentice may be designated as strains.

Diseases of Lettuce.—*Agric. Gaz. N.S.W.*, lvi, 6, pp. 251–254, 272, 7 figs., 1945.

Brief, popular descriptions are given of the following diseases of lettuce occurring in New South Wales, with recommendations for their control: spotted wilt [tomato spotted wilt virus: *R.A.M.*, xv, p. 538], stated to be the most serious of all, rendering lettuce-growing unprofitable in parts of the Sydney area in bad wilt years, the presence in the vicinity of the crops of alternate hosts of the virus undoubtedly being responsible for the prevalence of disease; downy mildew [*Bremia lactucae*], usually more important in the winter and early spring crops; *Sclerotinia* rot [*S. sclerotiorum*], damping-off, bottom rot (*Rhizoctonia* [*Corticium*] *solani*), *Septoria* leaf spot [*S. lactucae*], grey mould [*Botrytis cinerea*], bacterial rots, tipburn (non-parasitic), and leaf-yellowing and stunting (usually due to magnesium deficiency).

Kramer (M.), Orlando (A.), & Silberschmidt (K. M.). **Estudos sôbre uma grave doença de virus, responsável pelo deperecimento de nossos culturas de Alface.** [Studies on a serious virus disease responsible for the dying-off of our Lettuce crops.]—*Biológico*, xi, 5, pp. 121–134, 2 pl., 1945. [English summary.]

Lettuce crops in São Paulo, Brazil, have recently sustained heavy damage from a disease characterized by arrested growth, failure of head formation, and chlorotic and necrotic leaf spots, which is attributed to the agency of the lettuce mosaic virus. Losses in stands located on old soil, where seed of local origin has been sown for years in succession, may amount to 100 per cent., while even in plantings of United States seed on virgin soil the incidence of infection at the end of February, 1945, reached 10 or 12 per cent.

Experimental transmission of the disease was effected by means of the aphids *Myzus persicae*, *Macrosiphum sonchi*, and *M. solanifolii*, of which the last-named was distinctly less efficient than the other two, the relative percentages of successful tests on the Sem Rival, Big Boston, and Wayahead varieties being 100, 95·7, and 47, respectively. Particular interest attaches to the positive results obtained with *M. sonchi*, which was suspected as a vector of the disease in England [*R.A.M.*, xiv, p. 730], but is not known to act in this capacity in the United States. The virus was also shown to be transmitted through the seed to the extent of 5 to 15 per cent.

Lettuce mosaic may be combated by the use of selected, healthy seed, periodical roguing of infected plants, and of any weeds likely to harbour the virus, notably such Compositae as *Sonchus asper*, *Hypochoeris brasiliensis*, and *Senecio* sp., and the application to the plantings of nicotine sulphate sprays.

Ochoa (L.). **Mosaico amarillo. Nota sobre las semillas de los Frijoles en relación con esta enfermedad.** [Yellow mosaic. A note on Bean seed in relation to this disease.]—*Rev. Agríc. Habana*, xxvii, 28, pp. 17–19, 2 figs., 1944.

None of the 137 bean plants of two varieties raised from seed of yellow mosaic-infected plants at the Santiago de las Vegas Experiment Station, Cuba, developed

the least trace of the disease, and it is therefore concluded that transmission does not occur to any appreciable extent through this channel. The aphids responsible for the conveyance of the bean yellow mosaic virus from infected to healthy plants in the United States are absent from Cuba, but very active and efficient vectors, as yet unidentified, evidently exist in the latter country.

BREMER (H.). **On pod spots in Peppers.**—*Phytopathology*, xxxv, 5, pp. 283–287, 1 fig., 1 graph, 1945.

The author reports the occurrence in the Izmir (Smyrna) district of Turkey, and at the Central Institute of Plant Protection, Ankara, of a spotting of [chilli] pepper pods similar to that described by Weber from Florida as blossom-end rot [*R.A.M.*, xi, p. 803] and by Szirmai from Hungary as dry spot disease (heat injury) [ibid., xvii, p. 724]. The sunken lesions, bright-coloured at first, develop a hard, parchment-like texture under dry conditions, while in damp weather they may be overlaid by a shining, black mould, *Alternaria longipes*, which was shown by inoculation experiments, however, to enter the host exclusively through wounds. The disorder may result in the loss of 30 per cent. and upwards of the crop. From the limited data obtainable in the absence of adequate technical facilities, it appears that a disturbed water balance is the primary cause of both sun scald and blossom-end rot. Moderate but frequent irrigations should prevent the wide fluctuations in water supply which alone permit the normally beneficial action of strong solar radiation to assume a deleterious form.

SILBERSCHMIDT (K.) & CAMPOS (A. R.). **Estudos relativos à doença 'superbrotamento' ou 'envassouramento' da Mandioca.** [Studies relating to the 'superbudding' or 'witches' broom' of Cassava.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 1–26, 4 pl., 1944. [English summary.]

The 'superbudding' or 'witches' broom' disease of cassava was first observed in Brazil (Minas Gerais) in 1939, and in 1941 its presence in São Paulo was confirmed. The outstanding features of the disturbance are severe stunting of the whole plant, curtailment of the internodes, and production of an abnormally large number of lateral branches by the axillary buds. The lamina is often slightly chlorotic and its area may be reduced. Plants raised from cuttings of diseased shoots show definite symptoms of 'superbudding', which were also sometimes observed even in material taken from apparently healthy specimens grown in infested fields.

Transmission of 'superbudding' was effected only by means of side- or 'bottle'-grafting, the latter having been described by Harland (*Trop. Agriculture, Trin.*, iv, p. 96, 1927) in connexion with the vegetative propagation of cotton. 'Bottle'-grafting was the more successful of the two methods, with positive results in six out of seven tests, each comprising two to 12 plants, the transmission percentages ranging from 25 to 50 per cent., while the corresponding figures for side-grafting were two out of ten (one to eight plants) and 12·5 to 25 per cent., respectively. The incubation ('pre-patent') period of the virus was three to four months. Two successful grafting experiments, comprising seven and five plants, respectively, were further performed with diseased cassava scions on healthy *Manihot glaziovii* stocks, but the percentages of transmission were only 20 and 28·5 per cent., respectively, and the incubation period at least twice as long as in the case of the intra-specific grafts.

The experimental results point to a virus as the agent of the 'superbudding' disease. Analogies between the cassava disorder and the published descriptions of other virus diseases involving witches' broom production lend support to this hypothesis, and the agreement between the 'superbudding' symptoms and those of some types of the cassava mosaic reported by H. R. A. Muller from Java [*R.A.M.*, xi, p. 152] suggest the identity of the two conditions. The discussion

concludes with a survey of the literature on the various disturbances of cassava to which the name of 'mosaic' has been applied.

CHEO (C. C.) & JENKINS (ANNA E.). **Elsinoe and Sphaceloma diseases in Yunnan, China, particularly Hyacinth Bean scab and scab of Castor Bean.**—*Phytopathology*, XXXV, 5, pp. 339–352, 5 figs., 1945.

Five diseases caused by *Elsinoe* and *Sphaceloma* spp. were observed by the first-named writer in Yunnan Province, China, in 1938–9, three of which, namely, rose and grape anthracnose (*S. rosarum* and *E. ampelina*, respectively), and sour orange scab (*E. fawcetti*), had already been recorded from the country [*R.A.M.*, xii, pp. 96, 395; xvi, p. 840], while the other two, viz., hyacinth bean (*Dolichos lablab*) scab (*E. dolichi*) and castor bean (*Ricinus communis*) scab (*S. ricini*) were apparently new. The presence of the former had been reported without a description by Hansford from Uganda [ibid., xiii, p. 290], and part of D. C. Edwards's material from Kenya became available in 1936 to Miss Jenkins, who was likewise furnished with specimens of the latter from Formosa by K. Sawada before its detection in China. Latin diagnoses of these two species have already been published [ibid., xxi, p. 45].

Inoculations with potato agar cultures of *E. dolichi* gave positive results on *D. lablab*, but were unsuccessful on sword and jack beans (*Canavalia gladiata* and *C. ensiformis*) and Lima beans (*Phaseolus lunatus*). Similarly, four castor bean varieties, i.e., green petiole with (*a*) large, smooth and (*b*) large, thorny capsules, and red petiole with (*a*) large, thorny and (*b*) small, thorny capsules, reacted positively to inoculation with *S. ricini* in all the tests except those in which the inoculum was (*a*) deposited on the lower leaf surface or (*b*) consisted of a weakly pathogenic, black saltant of the fungus. Comparative cultures of these two species and *E. phaseoli*, *E. fawcetti*, and *S. arachidis* showed all to be distinct.

KHAN (A. R.) & BHATNAGAR (M. P.). **Cowpea varieties and culture.**—*Indian Fmg*, vi, 5, pp. 212–213, 1945.

Studies carried out at Karnal since 1937 showed that the cowpea varieties referred to as Nos. 585, 700, 782, and 397 are resistant to wilt (*Macrophomina phaseoli*) [cf. *R.A.M.*, xiv, pp. 208, 742; xxiii, p. 187].

KUHNHOLTZ-LORDAT (G.). **Les appellations d'origine et le court-noué.** [Place-names denoting origin and court-noué.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 35–38, 1944.

The author states that, so far as is known at present, vine court-noué [*R.A.M.*, xxii, p. 195] is an incurable disease, which grows progressively worse every year until sterility (pathological 'coulure') [failure of the flowers to set: ibid., xviii, p. 724] develops. Growers appear to be unaware of the course of the disease, and think that vines are affected only when they show shortened internodes and present a bushy, stunted appearance; the earlier stages of the disease escape notice or are misunderstood. The first symptoms of court-noué (various deformations, such as flattening and bifurcation of the branches, fasciation, finely-cut leaf edges, and leaf-yellowing) often appear long before the shortening of the internodes; 'coulure' may even be present, and grow worse year by year.

When yield has been seriously reduced for some years, growers begin to remove the vines, starting with the rows most severely affected. The two or three rows nearest to the space left empty then begin to show signs of the disease. The removal of affected vines favours the spread of the condition. In the author's opinion, court-noué in its early stages is a physiological masking of the true causes of the progressive decline in yield, this decline being too often attributed to the state of fertility of the soil.

Healthy vines introduced into affected vineyards become affected, and rapidly so if diseased vines are removed a few at a time and replaced by healthy ones. Control, however, can be undertaken in the case of localities where no vine has been grown for a long time. These must be planted with entirely healthy vines, i.e., both graft and stock being unaffected. The search for healthy mother-vines and suitable localities to plant them in should be undertaken at once, and by specialists.

SUKHOV (K. S.). **On certain conditions of formation of intracellular virus inclusions.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xlv, 4, pp. 169–172, 4 figs., 1944.

The author reviews recent work on intracellular virus inclusions and briefly indicates the results of his own work on the viruses of tobacco mosaic, winter wheat mosaic, and oats pseudo-rosette [*R.A.M.*, xxiii, p. 257; xxiv, p. 167].

WALLACE (G. B.) & WALLACE (MAUD M.). **Tanganyika Territory fungus list: recent records. VI.**—*Mycol. Circ. Dep. Agric. Tanganyika* 15, 2 pp., 1945. [Mimeographed.]

Two distinct leaf spots of cauliflower have recently been noted in Tanganyika Territory, viz., dark leaf spot, already recorded locally on cabbage, caused by *Alternaria circinans* [*A. oleracea*], and brown rot, due to *A. brassicae* (Berk.) Bolle [*A. brassicae* (Berk.) Sacc.]. Brown rot has also been observed on turnip.

New records for the Territory since December, 1944, include leaf spot (*Cercospora beticola*) of spinach beet [*Beta vulgaris* var. *cicla*], bitter rot (*Glomerella cingulata*) of apples and pears, leaf spot (*C. viticola*) [? *C. vitis*: *R.A.M.*, xv, p. 200; xxi, p. 324] of vine, leaf blotch (*Rhynchosporium secalis*) of barley, crown rot (*Puccinia coronata*) and leaf spot (*Helminthosporium avenae*) of oats, leaf spots of sorghum due to *H. turcicum*, *Colletotrichum graminicola*, (?) *Gloeocercospora sorghi* [ibid., xxii, p. 302], and a species of *Cercospora* other than *C. sorghi*, stem disease (*Plenodomus destruens*) [ibid., xi, p. 535] of sweet potato, stem and root rot of the same host due to *Macrophomina phaseoli*, root disease (*Rhizoctonia bataticola*) [*M. phaseoli*] of soy-bean, and anthracnose of ginger leaves, possibly due to *Colletotrichum zingiberis*.

Bacterial ring rot (*Xanthomonas solanacearum*) was found in potato plots planted with seed from Kenya. The same organism also caused a serious wilt of tomatoes at Lyamungu.

WALLACE (G. B.). **Report on a plant disease survey in the Lake and Western Provinces and on the Central Railway, March–April, 1945, by the Plant Pathologist.**—*Mycol. Circ. Dep. Agric. Tanganyika* 17, 11 pp., 1945. [Mimeographed.]

The sweet potato disease, apparently of virus origin, recently described by Hansford from Uganda [*R.A.M.*, xxiv, p. 117], was seen by the author in March and April, 1945, at Bukoba, Biharamulo, Ngara, Mwanza, Shinyanga, Tinde, Tahora, Kigoma, Kasulu, Dodoma, Morogoro, and Korogwe, Tanganyika Territory, and was also reported from Amani. The same virus disease, apparently, was also found on six wild species of *Ipomoea* in widely separated localities. Stem disease (*Plenodomus destruens*) [see preceding abstract] was also found in all areas visited, except Morogoro, though it is doubtless present there too; at Ngara, it was at least as severe as the virus disease.

Cassava mosaic was present everywhere, but no brown streak [ibid., xxii, p. 7] was noted. The only record of brown streak in the Lake Province is an observation by F. W. Thomas, who noted definite symptoms at Karagwe. Cassava strains bred at Amani and resistant to mosaic are being multiplied for distribution to native

growers. Cassava leaf spot due to *Cercospora henningsii* [ibid., xxi, p. 242] was present everywhere, but unimportant.

Even young sorghum showed the presence of downy mildew (*Sclerospora sorghi*) [ibid., xviii, p. 517; xix, p. 72]. The diseased plants have a characteristic bunched, upright growth, and where the healthy plants are of an even height, they appear taller than the latter; they seldom form ears. All affected plants should be removed.

The solar method of treating sorghum seed against grain smut [*Sphacelotheca sorghi*: cf. ibid., xx, p. 289], in which the seed is soaked in water for four hours and then dried in the shade, was used successfully at Ukiriguru, but at Morogoro the treated seed failed to germinate. The leaf spots produced on sorghum by *Gloeocercospora sorghi* [ibid., xxii, p. 302] were very variable in colour and shape, but all were recognized as the same disease by the presence of raised, black sclerotia, generally present in lines on both surfaces of the spots.

Bulrush millet [*Pennisetum typhoides*] downy mildew (*Sclerospora graminicola*) [ibid., xi, pp. 507, 634] is moderately common; young plants should be destroyed directly they become infected. Rice near Mwanza was affected by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*]. Cowpeas at Nyamahona showed intense infection by mosaic [ibid., xxi, p. 282], but the effect on the crop was very mild. Rust (*Uromyces vignae*) [ibid., xviii, p. 91] was also present, and both diseases were noted at Fela also; brown leaf spots and marginal light brown areas on cowpeas at Ukiriguru were probably due to *Bacterium* [*Pseudomonas*] *vignae* [ibid., xv, p. 772; xxiii, p. 469]. Yams [*Dioscorea* spp.] at Bukoba were affected by leaf spot (*Cercospora carbonacea*) [ibid., vi, p. 602].

Fifty-seventh Annual Report of the Rhode Island Agricultural Experimental Station.—39 pp., 1945.

The following items in this report may be mentioned [*R.A.M.*, xxiv, p. 138]. Isothan Q15 (lauryl isoquinolinium bromide), used at a dilution of 1 in 5,000, gave 94 per cent. control of apple scab [*Venturia inaequalis*] on McIntosh foliage when unsprayed trees showed an average of 11 scab lesions per leaf. This record equals the control given by Camden sulphur at 10 lb. per 1,000 gals. and is superior to fermate, used at 1½ lb. per 100 gals. in the same test. Furthermore isothan Q15 inactivates scab lesions and gives greater latitude in timing spray applications with equal control. Complete coverage is obtained with less solution. It is compatible with lead arsenate and nicotine sulphate and no discomfort was experienced by the user. This fungicide is the best so far tested in the experimental orchard, although some injury was caused at concentrations of 1 in 2,000.

An organic mercury-containing spray, puratized N5–D at a toxicant concentration of 1 in 20,000 in water, again provided almost perfect control of apple scab as in the 1943 trials. Military requirements continued to make this fungicide unavailable for use.

Treating apples with heavy concentrations of carbon dioxide for short periods at the start of the storage season promises effective control of scald of Rhode Island Greenings.

On certain potato plantations, sulphur was added to the soil to increase the acidity and lime added to other plots to produce a more neutral reaction. The yield was found to increase with an increase in P_H up to 5·5, but fell when the P_H was above 6·0. Below P_H 5·5, scab was insignificant, but rose to 15 per cent. between P_H 5·5 and 6·0, and to 21 per cent. above P_H 6·0. Plots treated with limestone produced more scabby potatoes than those treated with gypsum (which did not change the acidity) even though the latter received twice as much CaO. It is concluded that the increase in P_H from the limestone caused more scab than the increase in available calcium from the gypsum.

An experiment in determining the effect of rainfall on the pathogenicity of *Pseudomonas medicaginis* var. *phaseolicola* was undertaken with two lots of Asgrow stringless Black Valentine beans presumed free from halo blight, one from Idaho and the other from California. Disease readings for the former showed 10 per cent. of the leaves attacked, and for the latter 3 per cent. and none on the pods. French horticultural beans planted near by showed 100 per cent. infection. The source of bean seed is therefore an important factor in disease control.

TOBIE (W. C.). **A proposed biochemical basis for the genus Pseudomonas.**—*J. Bact.*, xlix, 5, pp. 459–462, 1945.

A. G. Lochhead has recently (*J. Bact.*, xlv, p. 574, 1943) proposed the enlargement of the genus *Pseudomonas* [*R.A.M.*, xxiii, p. 476] to include the red, halophilic bacteria hitherto assigned to *Serratia*, and this suggestion is supported by the writer, who further advocates the transference to the former of rod-shaped organisms producing water-soluble phenazine pigments, regardless of their colour, or water-soluble, fluorescent pigments, or both. Such pigments apparently play an important part in the life-history of the bacteria secreting them, and may therefore well serve as a biochemical basis for the reclassification of the group on more rational lines than those hitherto adopted.

TERVET (I. W.). **The microflora of Wheat and Barley seed grown in Minnesota and the Dakotas in 1944.**—*Plant Dis. Reptr*, xxix, 19, pp. 474–487, 5 maps, 1945. [Mimeographed.]

In comparison with 1943 [*R.A.M.*, xxiv, p. 13], seed of the 1944 wheat crop was less heavily infected with seed-borne pathogens. Laboratory tests failed to confirm field observations of severe infection by *Gibberella zeae*, and it is thought that conditions favouring infection may have lasted only a short time while the grain was in a susceptible stage. *Helminthosporium* spp. were again the predominant pathogens on barley seed, particularly in South Dakota and central Minnesota. *G. zeae* occurred in a moderate amount.

FUGGLES-COUCHMAN (N. R.) & WALLACE (G. B.). **Cultivation and diseases of Wheat.**—*Pamphl. Dep. Agric. Tanganyika* 38, 19 pp., 1945.

In the section of this pamphlet dealing with wheat diseases in Tanganyika Territory (pp. 13–19) it is stated that six physiologic races of stem rust (*Puccinia graminis*) (K1 to K6) have been recognized locally [*R.A.M.*, xiii, p. 217; xix, p. 71], and all the widely grown wheat varieties are attacked, except 192. In 1942, yellow rust (*P. glumarum*) was general in the Northern Province, and since then it has become progressively more severe. In 1943 it was observed in the Lushoto District. In Tanganyika, varieties lose their resistance at much lower altitudes than in Kenya. Intensity of infection increases everywhere with altitude. In the Northern Province, wheat is grown down to 4,300 ft., at which elevation the leaves of Kenya Governor, 192, and Simpson's L 3 are affected; the leaves of Australian are attacked at 4,400 ft. and of Simpson's Rongai at 4,500 ft. Reward shows leaf infection at 4,500 ft., B 256 G at 5,900 ft., and Reliance at 5,800 ft. Direct infection of the florets occurs only at much higher elevations. Fields not found infected were 58 F (L 1), 112 A, 117 A, and Sabanero at various altitudes between 4,500 and 6,000 ft. The destruction of volunteer wheat, particularly in the moister and higher localities, would probably reduce the sources of infection at the beginning of the following season.

Leaf rust (*P. triticina*) occurs at all elevations at which the crop is grown, but is less important. Before harvest, Kenya Governor seemed more resistant than 192 or the Simpson wheats. Black chaff (*Bacterium translucens* var. *undulosum*)

[*Xanthomonas translucens* var. *undulosa*: ibid., xxii, p. 16] has been abundant only occasionally. Glume blotch (*Septoria nodorum*) is more common. Loose smut (*Ustilago tritici*) calls for little attention. *Gibberella saubinetii* [*G. zeae*] produces head blight, but is not serious.

WALKER (A. G.). **Rhizomatous grass weeds and Ophiobolus graminis (Sacc.).**—*Ann. appl. Biol.*, xxxii, 2, pp. 177–178, 1945.

The author describes an examination of grass plants taken in 1944 from a field sown successively with silage mixtures, potatoes, and wheat, which established the presence of *Ophiobolus graminis* on *Agropyron repens*, *Agrostis* spp., and *Holcus lanatus*, surviving from sods undecomposed when the field was ploughed up after bearing the silage crops [*R.A.M.*, xxiii, p. 338]. Washed roots of *Agropyron repens* and *Agrostis* spp., examined under the binocular dissecting microscope, showed roots, apparently clean, bearing mycelium, the rhizomes of *Agropyron repens* being covered in plate mycelium [ibid., xiv, p. 622] where infection was severe; while *Agrostis* spp., although mildly attacked, showed runner hyphae, and must be regarded under field conditions as a host plant whose danger lies in its abundance and wide distribution. Only a few plants of *H. lanatus* were present and 35 per cent. of these showed infection compared with 69 per cent. for *Agropyron repens* and 27 per cent. for *Agrostis* spp. Adequate cultivation is required to destroy such potential sources of infection as these weeds.

COFFMAN (F. A.), HEYNE (E. G.), JOHNSTON (C. O.), STEVENS (H.), & MURPHY (H. C.). **Improvement and distribution of spring-sown Red Oats.**—*J. Amer. Soc. Agron.*, xxxvii, 6, pp. 479–498, 1 fig., 1945.

In 1926 a co-operative hybridization programme was introduced for the breeding of oats of the Fulghum type for resistance to smut [*Ustilago avenae* and *U. kolleri*: see next abstract], crown rust [*Puccinia coronata*], and stem rust [*P. graminis*: *R.A.M.*, xxi, p. 251; xxiii, p. 97] in the spring-sown red oats region, extending from coast to coast across the central portion of the United States, exclusive of the Rocky and Appalachian Mountains and western desert areas. From crosses then made, the smut-resistant variety, Fulton, was developed and distributed to Kansas farmers in 1939.

In 1929 the South American Victoria, which is exceptionally resistant to *P. coronata*, was crossed with Red Rustproof in Idaho, and later with many other varieties. From a Victoria × Richland cross have sprung the disease-resistant, early-maturing Boone, Cedar, Control, Tama, Vicland, and Vikota [ibid., xxiv, p. 356], which are being extensively grown in the Corn Belt proper and to some extent in the spring-sown red oats zone. In 1935 the more promising selections available in Kansas were mated with crown and stem rust-resistant segregates from the Victoria × Richland cross. The selected offspring of these crosses include a number of very desirable, early-maturing, prolific, rust- and smut-resistant varieties, e.g., Ventura, already distributed in California, and Osage and Neosho, which have been increased for distribution in Kansas in 1945. Crosses have been made to add rust resistance to the other attractive qualities of Columbia, and to combine in otherwise satisfactory varieties resistance to race 45 of *P. coronata* and 8 and 10 of *P. graminis*.

To sum up, as a result of the breeding programme, varieties are now available for the spring-sown red oats area combining reasonably good plant and grain characters with resistance to all the more common races of the rusts and smuts. There is room, however, for further improvements in growth habit, as well as for resistance to some of the new and threatening races of the diseases under observation, and the present activities of the programme are focussed on the correction of these deficiencies.

HANSING (E. D.), HEYNE (E. G.), & MELCHERS (L. E.). **Studies on smut-resistant Oats for Kansas.**—*J. Amer. Soc. Agron.*, xxxvii, 6, pp. 499–508, 1945.

Some of the information presented in this paper has already been noticed [see preceding abstract]. In 1935 and 1936 Fulton, a selection from a cross between Fulghum and Markton oats, was shown to be intermediate in susceptibility to a new physiologic race of loose smut (*Ustilago avenae*) designated the 'Fulton smut'. Kanota and Fulghum were susceptible, Columbia and Marion moderately so, and Richland, Markton, Trojan, Brunker, Otoe, New Nortex, Tama, Boone, Fultex, and Victoria highly resistant to the new race. In 1935 two crosses were made between Fulton and Victoria × Richland and several additional ones between Fulghum × Markton and Fulghum × Richland selections. Most of the Fulton × (Victoria × Richland) selections, including the promising Osage and Ventura, eventually developed an intermediate degree of susceptibility to the 'Fulton smut', whereas most of those derived from (Fulghum × Markton) × (Victoria × Richland), including Neosho and C. I. 4140, were highly resistant.

All the varieties and hybrid selections included in the trials herein described were resistant to the Fulghum smut except Fulghum, Kanota, Frazier, and Fowld's Hulless, while the last-named and Richland were the only two showing appreciable susceptibility to the Richland race.

ROLL-HANSEN (F.). **Undersøkelse av Gibberella saubinetii (Mont.) Sacc. som fotsyke på Havre 1940.** [Investigation of *Gibberella saubinetii* (Mont.) Sacc. as foot rot of Oats 1940.]—*Meld. St. Frøkontr. Ås, 1939–40*, pp. 32–38, 1941. [Received September, 1945.]

It is concluded from the results of experiments in 1940 on the control of foot rot of oats (*Gibberella saubinetii*) [*G. zeae*] in Norway that the principal source of infection lies in the seed; that there is little spread of the disease from row to row, at any rate in the early summer; that little or no contamination arises from the soil; and that seed treatment with ceresan or germisan is not altogether effectual.

VERGANI (A. R.). **Transmisión y naturaleza de la 'lepra explosiva' del Naranjo.** [Transmission and nature of 'lepra explosiva' of the Orange.]—[*Publ.*] *Minist. Agric. B. Aires*, Ser. A, i, 3, 4 pp., 4 figs., 1945.

Particulars are given of experiments at Bella Vista, Corrientes, Argentina, on the transmission of 'lepra explosiva' of the orange [*R.A.M.*, xxi, p. 486], which was effected solely by means of the artificial infestation of the trees with the Acarid, *Tenuipalpus pseudocuneatus*. The disease is therefore attributed to the agency of toxins secreted by the insects. Excellent control has been secured over a period of seven years by the application to the affected trees of appropriate insecticides.

SMITH (C. O.) & KLOTZ (L. J.). **A more virulent black pit organism on Citrus.**—*Calif. Citrogr.*, xxx, 10, p. 303, 1 fig., 1945.

From brownish, depressed spots, 1·5 in. in diameter, found on lemon and Valencia orange fruits in Californian groves, either alone or in association with lesions due to *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xxiii, p. 128], the authors isolated an organism which gave a form of growth typical of black pit and on inoculation produced spots up to 1·5 in. in diameter. As spots of this size have not before been found in nature, the isolates in question appear to be highly virulent.

GODFREY (G. H.). **A gummosis of Citrus associated with wood necrosis.**—*Science*, N.S., cii, 2640, p. 130, 1945.

A type of gummosis [*R.A.M.*, xxi, p. 128], described as the most prevalent and serious citrus disease in the Lower Rio Grande valley, Texas, arises from cracks

in the bark, overlying and connected with irregular bands of necrotic wood, the greater part of which lies well beneath the outer wood layers, the longitudinal sections being usually several times the lateral spread in extent. Affected wood is firm, and only slightly darker than normal, except that the advancing border region is more or less salmon-pink and becomes brighter soon after exposure to the air. An organism resembling a species of *Actinomyces* is suggested by the detection of hyphae of extremely small diameter and what appear to be spores of equal size budding off their tips; and it was observed making an inter- and intracellular advance through the tissues in the medullary rays as well as in the longitudinal fibres. The secondary invader, *Diplodia natalensis* [ibid., xxiv, pp. 188, 189], has been located in the dead wood in the older necrotic regions.

The disease occurs commonly in sweet orange, grapefruit, and the Meyer lemon. Characteristic necrotic bands, followed by gummosis, have been produced in healthy branches by inoculation with pink border wood into a chisel wound, but all attempts to isolate the primary organism have failed. It seems clear that the disease is parasitic and points of entrance have been found in unprotected pruning wounds, in branches broken by a storm, in wood injured and cracked by freezing, and in bark injuries made by the shoes of pickers and pruners. The rapidity with which the disease spreads is shown by the fact that an advance of 1½ ft. downward in 30 days has been observed. However, as the downward spread appears to stop at the line of bud union between the rootstock and the top, the sour orange rootstock would seem to be immune.

HAAS (A. R. C.). **Boron in Citrus trees.**—*Plant Physiol.*, xx, 3, pp. 323–343, 8 figs., 1945.

The author found gum present in the peel of lemon and orange fruits, in the core of orange fruits, and filling the woody tissues of trees grown in solution cultures lacking boron [*R.A.M.*, xvii, p. 519]. Gum exuded from cut surfaces and protruded through the bark. The intracellular presence of gum, denoted by translucent spots, contributed to leaf distortion, often with subsequent destruction of the terminal meristematic tissue and growing points in twigs. No single symptom can be considered, however, as characteristic or specific for boron deficiency or excess. The boron content of orange juice varies with the soil on which trees are grown. In the case of Valencia orange fruits, boron content is observed to increase with age; and treatment of soil with boron in various quantities increased the water-soluble boron content of the leaves of Navel orange trees and of the fruit pulp. In dried citrus tissues, a large amount of boron insoluble in distilled water was found to be soluble in weak acid.

CHILDS (J. F. L.) & SIEGLER (E. A.). **Scientific apparatus and laboratory methods; compounds for control of Orange decays.**—*Science*, N.S., cii, 2638, p. 68, 1945.

Fruit decays caused either by stem-end rot (*Phomopsis* [*Diaporthe*] *citri* and *Diplodia natalensis*) or the blue and green mould organisms (*Penicillium digitatum* and *P. italicum*) have been the subject of prolonged investigation by the United States Department of Agriculture Subtropical Fruit Field Station, Florida. Treatment of the fruit with the otherwise strikingly satisfactory control agent thiourea [*R.A.M.*, xxiv, p. 147] cannot be recommended until extended feeding tests have been completed. As a result of a search for less objectionable compounds of equal efficacy it has been found that thioacetamide, 8-hydroxy quinoline sulphate, and 2-aminthiazole, provide a satisfactory measure of control, immersion of oranges from 2 to 5 seconds in 5 per cent. solutions of these substances reducing percentage decay from 32·9 to 1·7, 32·6 to 10·5, and 42·2 to 7·5, respectively. The presence of both an amino group and sulphur is at once common to the chemical structure

of these compounds and essential to their successful fungicidal activity. As in the case of thiourea, however, these three compounds may require considerable toxicity investigation before they can be accepted for use.

SCHOPFER (W. H.). **La biotine, l'aneurine et le méso-inositol, facteurs de croissance pour Eremothecium ashbyii Guilliermond. La biosynthèse de la riboflavine.** [Biotin, aneurin, and meso-inositol, growth factors for *Eremothecium ashbyii* Guilliermond. The biosynthesis of riboflavin.]—*Helv. chim. Acta*, xxvii, 5, pp. 1017–1032, 1 fig., 1944.

Eremothecium ashbyii, a parasite of cotton capsules [*R.A.M.*, xv, p. 719], was found to grow well on various natural media, e.g., wheat germ, potato, oats, and beet extract agar, riboflavin production being most abundant on the first two and also on peptonized substrata, which supported only moderate development of the fungus. Biotin (vitamin H) was shown to be an essential growth factor for *E. ashbyii*, whereas aneurin (vitamin B_1) and meso-inositol were merely complementary, intensifying the action of the first-named. In this respect, as in others, *E. ashbyii* resembles *Nematospora gossypii*, but the auxo-heterotrophy of the former is more marked than that of the latter.

BARDUCCI (T. B.), GARCÍA RADA (G.), & WILLE (J.). **Control of internal boll rot of the Cotton plant, caused by insect punctures (Dysdercus sp.), through selection of resistant strains.**—*Nature, Lond.*, clvi, 3956, pp. 235–236, 1 fig., 1945.

Following up the work of R. L. Steyaert on the selection of cotton for resistance to stigmatomycoses in the Belgian Congo [*R.A.M.*, xviii, p. 797], the writers isolated from rotten bolls, naturally infected in the northern coastal regions of Peru through cotton-stainer (*Dysdercus ruficollis*) punctures, bacteria, an unidentified fungus, *Alternaria* sp., and *Acremonium* sp., of which the two last-named appear to be the most virulent. *Nematospora* spp. did not develop. Inoculation experiments with the several organisms on four bolls from each of 160 selected plants resulted in the complete rotting of a large percentage, but 12 plants of four strains proved to be resistant, especially No. 16–38 (LM No. 7–35 group). It would appear from these preliminary data that the Peruvian varieties (*Gossypium barbadense* var. *peruvianum*) used in the authors' experiments are genetically more resistant to internal boll rot associated with stigmatomycosis than the American *G. hirsutum* with which Steyaert worked.

Progress Reports from Experiment Stations, season 1943–44.—176 pp., 1 pl., London, Empire Cotton Growing Corporation, 1945.

The following items of interest are presented from these reports [cf. *R.A.M.*, xxiii, p. 296]. At Barberton, South Africa, experiments on red loam soil to test the effect of various elements, potash and dolomite limestone on the general development of the cotton crop, showed that on all plots not receiving potash growth fell away early, although growing conditions were still good, and *Alternaria* spread rapidly. Plots receiving potash, either alone or in combination, maintained their growth for a few weeks longer, but were finally attacked by *Alternaria* in the same way. This extra growth increased their mean yield to 1,080 lb. per acre of seed cotton, compared with a mean of 485 lb. from all others.

Blackarm (*Bacterium* [*Xanthomonas*] *malvacearum*) causes moderate to serious direct loss in southern and central Gezira and in the Gash territory when climatic conditions favour rapid dissemination of the pathogen. Tokar is almost free from the disease because of its climate. Control in the Gezira is sought by seed disinfection (abavit B), delayed sowing, root-pulling and burning after cropping, and by collecting and burning débris, all costly and laborious measures. Sufficient control

is, however, secured by these means to make the indirect effects of blackarm more serious than the direct crop loss. Delayed sowing, for example, reduces the average grade of the crop, and thus causes considerable loss. Other effects of blackarm are to restrict the southern Gezira, on the one hand, to producing X1730A (which is able to grow away from the disease), although it might prove desirable to grow Sakel in the south, and the Gash territory, the seed farm of the Gezira, on the other, to growing only such varieties as are required by the Gezira authorities. Clearly the indirect effects of the disease emphasize the importance for Egyptian cotton production of developing blackarm-resistant varieties.

In breeding for blackarm resistance X1730 (BAR.1730L) in the Gezira proved to be typical X1730 in every way, but capable of outyielding the commercial X1730A wherever blackarm was present. This strain will be sown on an increased area next season. Some 6,500 feddans in the Gezira will be sown next season with blackarm-resistant N.T.2 (BAR.2/41) seed, following successful raising of this seed in the Gash. Selection within the blackarm-resistant strains of X1730 and N.T.2 carrying B_2 began in 1942–3, and some of the best progeny rows in each type were bulked this season for sowing in nucleus multiplication plots. In other work the transference of blackarm immunity from *G[ossypium] sanguineum* to Sakel was taken to the third Sakel stage.

A repetition of the ravages caused by leaf curl some years ago has been prevented by root-pulling at the end of each season, growing X1730A in the Southern Gezira, Tokar, and part of the Gash, enforcing a dead season for 'bamia' (*Hibiscus esculentus*), and encouraging the growth of leaf curl-resistant Momtaza 'bamia' in preference to the local type. The disease, however, is still a potential danger throughout all the Egyptian cotton areas in the Sudan. Twelve strains, tested against Domains Sakel, included the latest of the blackarm-resistant N.T.2 and X1730 strains, which, like their parents, were highly resistant to leaf curl. Massey's Domains Sakel, selected from the previous season, also showed very high resistance, 6 per cent. at the end of March as against 48 per cent. for the control.

The establishment in 1938–9 at Bukalasa, Uganda, by the method of covariance of large and statistically significant differences between families in resistance to *Verticillium* wilt, showing BP.50 as the most susceptible, B.181 as highly resistant, and BP intermediate with a resistance capacity comparable with Buganda Local, which at that time served as a control, has encouraged an attempt to establish a genetic basis for resistance, and the stage has now been reached where pollen has been transferred from wilted plants of a susceptible substrain of BP.50 to healthy plants of a resistant substrain of B.181. The hybrid progeny will receive a soil inoculation of *Verticillium* and be selfed and back-crossed both ways.

In Nigeria blackarm does not normally reduce appreciably the yield of Allen. Native cotton from Sokoto (*Gossypium peruvianum*) is markedly resistant to leaf curl.

STEYN (D. G.). **Fungus-infected and fermented stock feed.**—*Fmg S. Afr.*, xx, 232, pp. 429–430, 448, 1945.

Referring to suspected cases of poisoning of stock through fungus-infected feeds, the author, after pointing out that maize cobs and stalks infected with *Diplodia zeae* may produce symptoms of paralysis [*R.A.M.*, xviii, p. 460], while *Paspalum* grass infected with *Claviceps* [*paspali*: ibid., xxi, p. 22] may cause hypersensitiveness and other symptoms, states that the main problem is the mixed fungal infection to which so many feeds are subject. The quantity of air in the feed, its moisture content, the temperature at which fungal growth takes place, and the degree of acidity of the feed are the main factors in determining toxicity. Over 20 types of symptoms induced are listed.

HOUSTON (B. R.). **Two important Flax diseases in California in 1945.**—*Plant Dis. Reptr*, xxix, 21, pp. 570–571, 1945. [Mimeographed.]

The author reports the isolation, for the first time in California, of *Fusarium lini* from the stem and root tissues of flax plants from the Imperial Valley. Varieties of Punjab C.I.20 and Argentine (Calar) C.I.463, planted in soil inoculated with cultures of the fungus, died in 10 days; Argentine seemed slightly more resistant than Punjab.

A survey of the flax-producing area of central California disclosed 40 per cent. of the crop in early-planted fields as severely attacked by [beet] curly-top virus [*R.A.M.*, xxiii, p. 486] with an estimated average of 8 to 10 per cent. for the whole area. The autumn migration of the leaf-hopper vector, *Eutettix tenellus* [ibid., xxi, p. 511], coinciding with the seedling stage of the flax plants, is regarded as responsible for the severity of infection in the earlier fields. Tests of 19 flax varieties for reaction to the curly-top virus showed 80 to 95 per cent. infection in the case of 11 varieties, including Argentine, Calar Foundation, C.I.980, C.I.1049, and Punjab, six with 65 to 80 per cent., Rio × Roman Winter–5 variety with 50 to 65, and C.I.1009 with 20 to 35 per cent. infection and, therefore, regarded as relatively resistant.

HOYMAN (W. G.). **Pythium aphanidermatum on Arizona Flax in the Salt River Valley.**—*Plant Dis. Reptr*, xxix, 21, pp. 569–570, 1945. [Mimeographed.]

This paper reports the isolation of *Pythium aphanidermatum* [cf. *R.A.M.*, x, p. 731] and *Fusarium* spp. on diseased roots of Arizona flax, plants of nine varieties of which, seeded on 23rd October, 1944, were found in the following January to have died during the seedling stage, their roots exhibiting symptoms of general necrosis and the surviving plants a yellowish foliage and weakly appearance. Seed of Argentine (pale blue), Bison × Abyssinia, Calar, Indian type, Ottawa × Bison (C.I. 1036), Ottawa × Bison (C.I.1040), Punjab, Viking, and 2558–2–C (Canada), planted in 10-in. pots containing steamed soil, infested with a recent isolate, all proved susceptible.

JOHANSEN (GUDRUN). **Hørsygdomme.** [Flax diseases.]—*Tidsskr. Planteavl*, xlviii, pp. 187–298, 2 col. pl., 17 figs., 1943. [Received August, 1945.]

This is an expanded account of the writer's studies on flax diseases in Denmark, a notice of which has already appeared from another source [*R.A.M.*, xxii, p. 433]. The present version contains much additional information, including the following. In August, 1942, the Concurrent variety at the State Phytopathological Experiment Station, Lyngby, was attacked by a mildew with spores measuring 29 to 38 by 13 to 16 μ (average 33 by 14·8 μ), thus corresponding to Škorić's *Oidium lini* and the mildew described on flax by Salmon and Ware [ibid., vi, p. 727].

Fusarium avenaceum was responsible for a brown discoloration and wilt of flax plants in north Jutland in 1940. Inoculation experiments showed the fungus to be actively pathogenic [ibid., xviii, p. 315], reducing the proportion of germination from 100 to 3 per cent. Another species of *Fusarium* with naviform, pedicellate, mostly triseptate conidia, 33·4 by 3 to 4 μ, inducing similar symptoms, proved to be only a weak parasite. *F. culmorum* [loc. cit.] also commonly developed on seed placed for examination on potato dextrose agar.

A species of *Phoma* found on young linseed plants in 1941, producing olive-green, later light brown, irregular, sharply delimited lesions on the leaves and cotyledons and reddish-brown spots and stripes on the root-collar was characterized by spherical, chestnut-brown pycnidia, 80 to 180 μ in diameter, with a pale-centred pore 12 to 17 μ in width, and hyaline, narrow ovate-ellipsoid spores, 5 to 7 by 2·5 to 3 μ: it is presumed to be identical with *P. exigua* [ibid., xviii, p. 316]. Another species closely resembling *P. lini* [ibid., xviii, p. 315] but with

smaller pycnidia (90 to 180 μ in diameter) caused exceptionally severe damage to the Canadian spinning flax variety, J.W.S., at Aarslev Experiment Station in 1942.

Botrytis cinerea occurred in the damp summer of 1942 on flax affected by grey speck [manganese deficiency] and lodging.

The mycelium and sclerotia of a fungus developing in cultures of flax seed were strikingly similar to those of *Sclerotinia libertiana* [*S. sclerotiorum*]. Two inoculation experiments with the organism resulted in a reduction of germination from 100 to 21 and 85 per cent., respectively.

Alternaria tenuis, a common saprophyte on flax straw damaged by fungal infections or stored under humid conditions, reduced germination from 100 to 79 and 70 per cent., respectively, in two tests, and a species provisionally attributed to *A. solani*, found on flax plants suffering from drought, manganese deficiency, and so forth, from 100 to 33 per cent.

Cladosporium herbarum is a common occupant of flax seed and straw in Denmark.

Observations are further presented on a number of physiogenic and deficiency diseases of the crop, and a tabulated account is given of laboratory and field disinfection experiments, the latter under the direction of C. Stapel, some of whose data have already been published [ibid., xxii, p. 433]. In 1942 the incidence of infection by *Septoria linicola* [*Sphaerella linorum*] on linseed fell from 68·5 to 10·3, 9·3, and 7·1 per cent. as a result of dusting with germisan-universal at dosages (per 100 kg.) of 1,600 gm., 800 gm. plus an oil 'binder' and 1,600 gm. plus oil, respectively, the first and second treatments also raising the germination percentages from 51 to 74 and 63, respectively. In 1943 dusting with tillantin [ceresan U.T.] 1875 at 2, 8, and 16 gm. per kg. with a steam 'binder' reduced the attacks of the same pathogen on the cotyledenary leaves from 65 to 12, 3, and 1 per cent., respectively, but at the two higher dosages germinative capacity was appreciably impaired. None of the mercurial fungicides effectively controlled *Polyspora lini*.

WEBER (ANNA). **En ny svampesygdom paa Løvemund.** [A new fungus disease of Snapdragon.]—Reprinted from *Gartnertidende, 1943*, May, 1 p., 2 figs., 1943. [Received August, 1945.]

Downy mildew (*Peronospora antirrhini*) of cultivated snapdragon (*Antirrhinum majus*) [*R.A.M.*, xvii, p. 686] was observed for the first time in Denmark in April, 1943, on the Fakkel [Torch] variety. The fungus had long ago been found in the country on the wild *A. orontium* [loc. cit.], but the mode of its spread to the affected nursery on the outskirts of Copenhagen is unknown. Applications of Bordeaux mixture retarded the progress of the disease, but failed to arrest it entirely.

HOLME HANSEN (H. H.), STAPEL (C.), & STEENBJERG (F.). **Undersøgelser af Lucernemarker paa Lolland-Falster.** [Investigations of Lucerne fields on Lolland-Falster.]—80 pp., 19 figs., 2 maps, Stifts-Trykkeriet, Nyköbing, Falster, 1945.

Investigations to determine the causes of the unthrifty condition of lucerne on the islands of Lolland-Falster, Denmark, have been in progress since 1938. The crop is of growing importance on the islands, where it covered an area of 4,263 ha. in 1944, representing over 3 per cent. of the total under cultivation. The following diseases were observed. Clover rot (*Sclerotinia trifoliorum*) did not in general cause appreciable damage, its attacks being mostly confined to the late winter or early spring. The fungus was frequently found passing from the much more susceptible red clover [*R.A.M.*, xxiii, p. 24] to lucerne, the two crops being commonly grown as a mixture. The exceptional prevalence of the disease in 1943 was doubtless a sequel to the abnormally mild late winter and early spring, when the mean temperatures for February, March, and April exceeded the normal range by 3° to 4°, 2°, and 2° to 3° C., respectively.

In 1941 and 1944, *Verticillium albo-atrum* developed on lucerne for the first time in Denmark, causing serious losses in the latter year, when a destructive outbreak was also reported from west Zealand. In 1943 the fungus was detected on the islands of Fünen and Möen.

Peronospora trifolii, *Pseudopeziza medicaginis*, and *Ascochyta medicaginis* were all in evidence but of no great importance.

In the autumn of 1943, *Stemphylium botryosum* [*Pleospora herbarum*] severely attacked a vigorous crop, the foliage of which was shrivelled as though by frost. In the corresponding season of 1944, the fungus again appeared in the same place and spread further over the field. The development of *P. herbarum* in the particular area under observation is attributed to the waterlogged condition of the soil, necessitating late sowing, and not to a deficiency of lime, which is supposed to favour the pathogen in other countries, the P_H ranging from 7·8 to 8·1.

The occurrence of the rare wart disease (*Urophlyctis alfalfae*) in three- and four-year-old fields in 1941 is difficult to explain, since the condition of the soil did not meet the excessive moisture demands of the organism.

HARDISON (J. R.). **Specialization in Erysiphe graminis for pathogenicity on wild and cultivated grasses outside the tribe Hordeae.**—*Phytopathology*, xxxv, 6, pp. 394–405, 1945.

Following up his studies at the Kentucky Agricultural Experiment Station on specialization in *Erysiphe graminis* on grasses of the tribe Hordeae and genus *Poa* [*R.A.M.*, xxiv, p. 233], the author tested the reactions of 123 species and eight varieties in 28 genera to eight cultures of the fungus from grasses outside that tribe, namely, two from *Avena* and one each from *Agrostis*, *Bromus*, *Dactylis*, *Festuca*, *Koeleria*, and *Polypogon*.

The detailed results, which are tabulated, show that seven of the cultures infect grass species outside the genus from which they were collected, while that from *K. cristata* infected only that species. Two cultures from *A. sativa* differed in pathogenicity and demonstrated specialization in *E. graminis* from *Avena*. Many grasses are susceptible to two or more widely different races and may perhaps permit hybridization between the races. Some races may conveniently bear varietal names if their specialization continues to be restricted, whereas several others have wide host ranges and a varietal designation for these appears to be impracticable. Ample opportunity for selection for mildew resistance is afforded by variation in reaction of collections of most grass species and between individual plants in many collections.

It is evident from these results that *E. graminis* on a particular grass species can no longer be assumed to be a specialized variety restricted in pathogenicity to species of the source genus. On the contrary, the tests have shown that it may be any one of a number of races or a mixture of these. The behaviour of cultures 8 and 23 from *Polypogon* and *Agrostis*, respectively, is specially suggestive of the existence of a complex group of mildew races with overlapping host ranges affecting grasses, notably certain genera of the Agrostideae. This information as to the general lack of restriction of the mildew races to any given genus permits recognition of the possibilities of interracial hybridization and of the potential sources of inoculum in the initiation of mildew infections, besides accounting for certain phases of the etiology and epiphytology of the disease.

JØRSTAD (I.). **Melding om plantesykdommer i land- og hagebruket. Sammenligning av sprøytemidler mot soppsykdommer på frukttrær.** [Report on plant diseases in agriculture and horticulture. Comparison of spray preparations against fungous diseases of fruit trees.]—38 pp., Oslo, Grøndahl & Søns Boktrykkeri, 1940. [Received September, 1945.]

The following are the main conclusions drawn from the results of spraying

experiments for the control of fruit diseases in Norway from 1937 to 1939 [cf. *R.A.M.*, xvii, p. 467]. Lime-sulphur was not surpassed in efficacy by any of the other sulphur-containing preparations tested against apple scab [*Venturia inaequalis*]. Of the non-sulphur fungicides tested, pomarsol [ibid., xxiv, p. 424] almost equalled lime-sulphur in efficacy. Lime-sulphur, sulphinox, and Acme lime-sulphur dust caused scorching of Åkerø fruits, which were not injured, on the other hand, by pomarsol, sulfomaag, or Bayer sulphur dust.

Excellent control of apple mildew [*Podosphaera leucotricha*] was afforded by various brands of lime-sulphur and good protection by polysulphide in one year's trials.

SCHNEIDER (H.), BODINE (E. W.), & THOMAS (H. E.). **Armillaria root rot in the Santa Clara valley of California.**—*Plant Dis. Reptr*, xxix, 19, pp. 495–499, 1945. [Mimeographed.]

Root rot (*Armillaria mellea*) is probably the most serious disease of stone fruits in California. Of 65 properties surveyed in the Santa Clara valley 34 had one or more infested areas, the incidence varying from one tree space to almost the whole of a property. A widely used method of control is to plant local fruit and nut crops on highly resistant stocks. Thus, walnuts are frequently planted on highly resistant California black walnut rootstock, prunes and apricots on resistant myrobalan [*Prunus divaricata*] 29 stock and pears on French pear stock, which is very hardy. Planting walnuts in spaces in fruit orchards is discouraged as necessitating two kinds of cultural and spray practices within the same orchard. The tops of walnut trees on the black walnut stock were frequently observed to be dying on reaching bearing age (black-line disease), and one case was reported of black walnut stock being killed by the oak-root fungus. Ten-year-old live prune trees on myrobalan stock were observed on infested ground in one orchard.

JØRSTAD (I.). **What is the correct botanical name of the Apple scab fungus?**—*Nyt. Mag. Naturv.*, lxxxiv, pp. 251–253, 1943. [Received September, 1945.]

Sydow has shown (*Ann. mycol., Berl.*, xxi, [p. 171], 1923) that the apple scab fungus, commonly known as *Venturia inaequalis* (Cke) Aderh., or more correctly as *V. inaequalis* (Cke) Wint. (emend. Aderh.) [*R.A.M.*, xv, p. 467], does not properly belong to the genus *Venturia*. He accordingly transferred it to his new genus *Endostigme* as *E. inaequalis* (Cke) Syd. Petrak (*Ann. mycol., Berl.*, xxxviii, p. 193, 1940) maintains that *Endostigme* is inseparable from Sydow's contemporary genus *Spilosticta* and re-names the pathogen *S. inaequalis* (Cke) Petr. In the author's view, however, *Endostigme* does differ from *Spilostica* in the possession of *Fusicladium* and *Pollaccia* conidial states and is entitled to retention as a distinct genus. '*Sphaerella cinerascens* Fleisch.' is, in the author's opinion, the oldest valid name for the perfect state of the scab fungus on *Pyrus aria*, *S. inaequalis* Cke being a synonym. Later homonyms are *Sphaerella cinerascens* [(Fuckel)] Fuckel and *S. cinerascens* (Schw.) Cke. As shown by Herbst *et al.* [*R.A.M.*, xvi, p. 618] and corroborated by the writer's observations in Norway, the scab fungi on *Sorbus* spp. (except *S.* [*P.*] *aucuparia*) and *Malus* [*P.*] spp. must be considered identical, the botanical name of the ascus state being *E. cinerascens* (Fleisch.) Jørst. [n. comb.] and that of the conidial *Fusicladium pomi* (Fr.) Lind., since *Spilocaea pomi* Fr. is the first legitimately published name.

BJÖRLING (K.). **En för Sverige ny Äpplesjukdom.** [An Apple disease new to Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 3, pp. 45–48, 6 figs., 1945.

From withered apple spurs in one locality of Sweden and from black-spotted fruits in another the author isolated a fungus producing two colony types in pure

culture, one grey (perithecial) and the other blackish-green (conidial), of which the former corresponded to *Pleospora mali* [? *P. herbarum*] and the latter to *Stemphylium congestum* as described by Newton from the United States [*R.A.M.*, vii, p. 789]. Since the dark-coloured colonies freely changed to the grey, either suddenly or gradually, the two types are presumed to be merely different stages in the life-cycle of a single fungus. Inoculation experiments gave positive results only on wounded fruits and spurs. Bramley, Sweet McIntosh, and Lane's Prince Albert were more susceptible than Newton Pippin and Schur, developing black, necrotic lesions 2 cm. in diameter in 20 days at 20° C.

ERIKSON (E.). **Certain aspects of resistance of Plum trees to bacterial canker. Part II. On the nature of the bacterial invasion of Prunus spp. by Pseudomonas mors-prunorum Wormald.**—*Ann. appl. Biol.*, xxxii, 2, pp. 112–117, 1945.

Artificial inoculations in winter with *Pseudomonas mors-prunorum* of resistant and susceptible varieties of three-year-old plum trees resulted in intercellular penetration of the tissues by the pathogen, causing plasmolysis of the cell contents, followed by disintegration of the cell walls, and gradual invasion by the bacteria, the maximum cankers caused thereby appearing in the spring [see next abstract]. Limitation of necrosis in summer is usually accompanied by the production of new tissue composed of xylem elements. Viable bacteria were isolated in the autumn from cankers in which the area of necrosis had penetrated beyond the limiting periderm. Lesions resulting in spring and summer from winter inoculations of resistant trees are generally very small, confined to the phloem, and effectively isolated by periderm. Discoloured streaks outside the periderm differ from those observed in susceptible trees in their comparative paucity and smallness in extent, and this reaction as well as the infrequence of browning in the xylem either indicates that the pathogen in the resistant tree fails to produce in comparable quantities metabolites deleterious to the host tissue or that the resistant host is not affected by such metabolites. The apparently more efficient host mechanism of periderm production in the resistant varieties is considered significant. Gum production is much more frequent in resistant trees but at most plays only a mechanical part in blocking invasion.

No difficulty was experienced in re-isolating the organism from either host between December and June; in July the bacteria were much rarer and isolations thereafter from the resistant trees unsuccessful. A few bacteria are thought to survive in the deeper-seated tissues of susceptible trees and may serve as foci of fresh infections in the autumn. This dying of the bacteria would appear to be due to physical factors or to a toxic accumulation of degeneration products.

The injection of cell-free filtrates of cultures of *P. mors-prunorum* caused lesions less extensive than those from inoculations with bacteria, but similar in histological aspect.

ERIKSON (D.) & MONTGOMERY (H. B. S.). **Certain aspects of resistance of Plum trees to bacterial canker. Part III. The action of cell-free filtrates of Pseudomonas mors-prunorum (Wormald) and related phyto-pathogenic bacteria on Plum trees.**—*Ann. appl. Biol.*, xxxii, 2, pp. 117–123, 2 figs., 1945.

The authors describe experiments designed to show whether the destruction of host cells before their penetration by *Pseudomonas mors-prunorum* [see preceding abstract] is due to the production of a toxin by the organism. Four injections of cell-free filtrates, each containing 2 to 3 c.c. liquid, were made under the underlayers of the bark and the outer layers of the wood into each of 80 three-year-old plum trees, by running a needle tangentially under the bark, and inserting the bent, finely drawn end of a small glass tube into the puncture. A more satisfactory method was found when a cotton wick, leading from a tube of solution, was

threaded into a needle and thus drawn into the bark. These filtrates caused injury similar to that produced by the organism itself, and the susceptible variety suffered more than the resistant trees, injury to which was negligible, the reactions of both being identical with their reactions towards the organism. As toxic filtrates were produced from cultures on bark extracts from both varieties as well as on synthetic media, it seemed that resistance lay in reaction of the host to the toxin rather than in a limitation in the production of toxin due to the presence of an inhibiting substance or substances or the lack of some essential constituent for the growth and parasitic development of the organism. The development of this toxin was considered to be specific to organisms closely related to *P. mors-prunorum*, since comparable cultures of other parasitic and saprophytic organisms failed to yield toxic filtrates. As toxic filtrates were not obtained from young, vigorously growing cultures, but only from aged media, a search was made for an endotoxin that might be liberated by the autolysis of the organism, and in this way a toxin of protein nature was obtained from the dried bacterial cells by acetic acid extraction [cf. *R.A.M.*, xv, p. 206]. No accurate knowledge of the antigenic constitution of *P. mors-prunorum* is yet available, and thus the serological properties cannot be correlated with pathogenicity or variations in virulence.

BOEHM (B.). **Apricot gummosis. Its spread in the Barossa district.**—*Aust. Dried Fruits News*, xxi, 5, pp. 14–15, 1945.

Before 1920 apricot gummosis was of rare occurrence in South Australia [*R.A.M.*, xviii, p. 121], about 1932 some 10 per cent. of the trees were involved, and since 1940 the disease is stated to have spread at an alarming rate. The various theories that have been advanced to explain the etiology of the disease are summarized.

ENGLISH (H.). **Fungi isolated from mouldy Sweet Cherries in the Pacific Northwest.** —*Plant. Dis. Reptr*, xxix, 21, pp. 559–566, 1945. [Mimeographed.]

Pullularia was found to be widespread in the Pacific Northwest and to occur twice as frequently as *Alternaria mali* (with one or more other *A.* spp.). *Cladosporium herbarum* and *Botrytis cinerea* are third and fourth, respectively, in frequency of occurrence and widely distributed on sweet cherries throughout the area. *Penicillium expansum* and other spp. were found wherever mature fruit was examined. *Sclerotinia fructicola* was found only once, *S. laxa* being more prevalent. *Rhizopus* rot makes rare but costly appearances, causing great loss in shipments of sweet cherries; *R. nigricans* [*R. stolonifer*], the fungus presumably responsible, thrives at high temperatures and is likely to prove epiphytotic on fruit consigned without proper refrigeration. A species of *Lambertella* resembling *L. jasmini* was isolated from a decaying sweet cherry from Oregon.

The most serious mode of fungal infection of cherries is through the cracking of maturing fruit as a result of the absorption of water during rainy weather. In 1942, for example, this accounted for two-thirds of the decay recorded, and nearly every year rain is responsible for injury sufficient to impair seriously the keeping quality of at least part of the fruit.

Several culturally distinct forms of *Pullularia* [*R.A.M.*, xxi, p. 532] have been isolated, but their specific identity remains to be determined; their pathogenicity is weak, and is greatly influenced by fruit maturity. Inoculations with spore suspensions do not suggest their capacity to invade uninjured cherries. The rots caused are usually small, rather depressed, brown, and under conditions of high relative humidity, such as are encountered in cold storage, the surface of the lesions tends to become sticky and the skin soft. *Pullularia* abounds in this sticky matrix and in the partly disintegrated host tissue. Minute, subepidermal stromata, which eventually become erumpent, are sometimes seen, giving the lesions a rather pebbled appearance. The fungus forms no aerial mycelium and does not

spread from one fruit to another by contact. The decayed tissue does not become watery and exude from packages as frequently occurs with *Rhizopus* rot and sometimes with blue-mould decay.

All *S. fructicola* and *S. laxa* infection originated from contact with completely rotted and presumably unfertilized cherries which had failed to drop at the usual time.

JØRSTAD (I.). **Melding om plantesykdommer i land- og hagebruket. Sykdommer på baervekster.** [Report on plant diseases in agriculture and horticulture. Diseases of small fruits.]—34 pp., Oslo, Grøndahl & Søns Boktrykkeri, 1942. [Received September, 1945.]

The last survey of the diseases affecting cultivated small fruits in Norway was included in the author's report on economic horticultural plants, published in 1928 [*R.A.M.*, vii, p. 700], and the following observations relate to the period between that year and 1941. Red currant rust (*Puccinia ribis*) [ibid., xvii, p. 704] extended its range in 1941 to Tromsö (68° 42′ N.), the most northerly point from which it has yet been recorded. Although it is long since Weymouth [white] pines (*Pinus strobus*) have been planted to any extent in Norway, blister rust (*Cronartium ribicola*) is still prevalent on black currants and was also reported on the White Dutch Grape variety from four localities [ibid., xv, p. 618]. The importation of white pine plants into the country is prohibited by an order of the Department of Agriculture of 31st January, 1941, and a further Departmental circular of 24th October of the same year authorizes horticultural functionaries to destroy infected specimens. Baldwin black currants were severely attacked by gooseberry mildew (*Sphaerotheca mors-uvae*), which was also detected on gooseberries in two new northerly districts, bringing its northernmost limit to 65° 19′ N. Black currant leaves are more apt to bear the perithecia of the fungus than those of gooseberry. This mildew was further observed on Prince Albert and Victoria red currants, *Ribes bracteosum*, and *R. alpinum*. Alkaline Burgundy mixture was the best of the fungicides tested against the disease in a series of trials from 1922 to 1929 [ibid., viii, p. 731]. Among the other parasitic and physiogenic diseases of gooseberries and currants included in the report may be mentioned the currant reversion virus [ibid., vii, p. 700], the incidence of which on black currants seems to be declining in the west, where the host is less extensively cultivated than formerly owing to poor conditions for the setting of the berries. Marginal leaf scorch caused heavy damage on red currants as far north as Namdal, and in 1940 it was reported on gooseberries from Fana. In most cases the trouble is curable by soil amendments with potassium sulphate at a dosage of 50 gm. per bush.

P. Stedje, in a report of the State Fruit Production Experiment Station, Njøs (Leikanger), 1932, ranks the raspberries comprised in a six-year study on varietal reaction to *Didymella applanata* in the following order of decreasing susceptibility: Hornet, Superlative, Pyne's Royal, Lloyd George, Paragon, Herbert, and Victoria; virtual freedom from the disease was shown by Asker, Devon, Fajstrup, Empress Dagmar, Marlboro, Park Lane, Profusion, and Red Cross. From the published observations of other workers, varietal reaction to spur blight appears to vary considerably, even within the Scandinavian countries, but the resistance at any rate of Fajstrup and Empress Dagmar may be considered well established. The raspberry yellow mosaic virus has long been present in Norway, where it is one of the factors in the sharp decline in the cultivation of the susceptible Marlboro. A number of reports of the disease were submitted during the years covered by the present review, many of them relating to the Asker variety.

Hitherto only the conidial state (*Oidium fragariae*) of strawberry mildew (*S. macularis*) [*S. humuli*] has been observed in Norway, where early varieties, notably Deutsch. Evern, are the most susceptible, another important factor favouring

the disease being light, warm soil. Wild strawberries have only once been found infected, in 1935. Good control was effected in 1930 and 1931 by dusting with finely ground sulphur or spraying with Høvdes mildew wash [ibid., xvii, p. 468] at 1·5 to 2 per cent. just before flowering. In spraying experiments in 1939 against leaf spots, primarily *Mycosphaerella fragariae*, two applications of 1 per cent. Bordeaux mixture between leafing and flowering increased the quantity of saleable fruit in one field from 36·4 to 82·8 hg.

SWARTWOUT (H.). **Raspberry anthracnose.**—*Hoosier Hort.*, xxvii, 6, pp. 87–88, 1945.

Writing in *Horticultural News* (Missouri State Horticultural Society), February, 1945, the author reports good control of raspberry anthracnose [*Elsinoe veneta*] in 1944 by one delayed-dormant application of an eradicant spray consisting of 8 lb. each copper sulphate and hydrated lime, 4 lb. zinc arsenite, 6 lb. copper arsenate, 1 gal. elgetol, and 2 qts. fish oil per 100 gals., which reduced the average number of lesions per cane from 139·6 to 9·6 compared with 48·1 for the standard two-spray lime sulphur schedule. Almost equally satisfactory results were given by two treatments with fermate (2 lb. in 100 gals. plus 2 qts. dendrol at the delayed-dormant stage and 1½–100 when the new shoots were 6 to 8 in. high), the number of anthracnose lesions per cane in this series being 11·3.

ZUNDEL (G. L.). **'Brown berry' or mild streak on Raspberry in Pennsylvania.**—*Plant Dis. Reptr*, xxix, pp. 567–568, 1945. [Mimeographed.]

The author and J. B. Demaree have reached the conclusion that 'brown berry' disease of raspberry [*R.A.M.*, xx, p. 312] is a symptom of what has been known as mild streak [ibid., xx, p. 26], which name they consider inappropriate and regard 'brown berry' or 'seedy' disease as more suitable. The disease has no stunting effect on young canes, the leaves of which, however, are hooked downward at the tips, with narrow, short, water-soaked or light grey streaks on the stem. These conditions become more pronounced with age, notably on the Morrison and Logan, and they are also found on the new Pennsylvania and Early Butler varieties. The fruit is seedy-looking and brown and the plants producing berries have a more or less yellowish appearance.

GHERSON (L.). **A disease of Fragaria caused by Fusarium orthoceras.**—*Palest. J. Bot.*, J. Ser., iii, 1, pp. 54–55, 1943. [Received August, 1945.]

In 1941 strawberry plants in a Jerusalem garden withered after rooting normally, and from white spots on the dried roots *Fusarium orthoceras* was isolated. Inoculation of the soil with suspensions of the isolate or of the roots through wounds induced the characteristic symptoms, and the plants died in 70 days, the fungus being successfully re-isolated. In culture it exhibited great morphological variability. The optimum temperature for growth was 24° C., at 4° growth was checked, and a temperature of 37° was lethal. The mycelium altered its colour according to the hydrogen ion concentration of the medium, being ruby to yellow in acid media and dark blue-grey in basic.

WILCOX (R. B.) & BERGMAN (H. F.). **Control of Cranberry fruit rots by spraying.**—*Circ. U.S. Dep. Agric.* 723, 6 pp., 1 fig., 1945.

In a test carried out in Massachusetts in 1944, the cranberry fruit rots caused by *Glomerella cingulata* var. *vaccinii* [*R.A.M.*, xix, p. 25], *Diaporthe vaccinii* [loc. cit.], and *Godronia cassandrae* [ibid., xv, p. 817] were again controlled as well by Bordeaux mixture (10–4–100) with a suitable spreader as by the same preparation at a concentration of 10–10–100. Early spraying, when nearly all the flowers were in the late-bud stage, gave better control than was obtained when this application

was omitted. Fermate applied at the rate of 2 lb. per 100 gals. water gave as good control as Bordeaux mixture (10–4–100) applied before the flower buds opened; under conditions of light infection, omission of the early application of fermate (late-bud) did not result in increased infection.

In New Jersey, where decay often occurs in the field before picking and is generally due to early rot (*Guignardia vaccinii*) [ibid., xxiii, p. 395] and blotch rot (*Acanthorhynchus vaccinii*) [loc. cit.], a test was carried out in 1943, in which fermate (3 lb. per 100 gals.), applied five times during the season, was compared with Bordeaux mixture (8–8–100). At harvest, the incidence of rot was only 5 per cent. for fermate, as against 58 per cent. for Bordeaux mixture and 90 per cent. for the untreated controls.

More extensive tests were made in 1944, using three and five applications of fermate (1, 2, and 3 lb. per 100 gals. and as a 10 per cent. dust diluted with talc) and of Bordeaux mixture (8–8–100 and 8–4–100). Two months after harvest the untreated controls showed 92 per cent. rot, the Bordeaux treatments 63 to 59 per cent., and the fermate treatments 39 to only 17 per cent., depending on the concentration of the fermate. The amount of fermate in lb. per acre applied as dust was equivalent to the amount applied as spray at 3 lb. per 100 gals., but the rot control that resulted was equivalent only to that given by the spray at 1 lb. per 100 gals. Fermate sprays were also tested on a commercial scale (up to 30 acres) in comparison with Bordeaux mixture by several New Jersey growers in 1944. In every case except one, where very little rot developed, the results were in favour of fermate.

On the basis of these results it is recommended that cranberries should be sprayed against fruit rots with either fermate or Bordeaux mixture (*a*) during the late-bud stage, but before appreciable flowering, (*b*) at the end of the flowering period, and (*c*) two weeks later. When fruit decay has been very serious two further applications may be made at intervals of about two weeks. On bogs where fruit rots have been serious, fermate (3 lb. per 100 gals.) will probably give better control than Bordeaux mixture of any strength. Bordeaux mixture (8–4–100) will, however, considerably reduce infection, and where little rot is present may be as effective as fermate. With fermate no spreader is necessary, but with Bordeaux mixture 1 lb. calcium caseinate or 1 lb. resin fish-oil soap is advised.

WHETZEL (H. H.) & WOLF (F. A.). **The cup fungus, Ciboria carunculoides, pathogenic to Mulberry fruits.**—*Mycologia*, xxxvii, 4, pp. 476–491, 4 figs., 1945.

The cup fungus, originally known as *Sclerotinia carunculoides* [*R.A.M.*, i, p. 387; iii, p. 48], pathogenic to the white mulberry (*Morus alba*) throughout the south-eastern United States, and responsible for popcorn disease, is transferred, as a result of the researches presented in the present paper, to *Ciboria* and designated as *C. carunculoides* (Siegler & Jenkins) Whetzel. The fungus possesses sclerotial and apothecial phases, but no conidia; the ascospores are forcibly expelled, lodge on the stigmas, and initiate infection at the time of flowering. Each drupelet of the aggregate fruit may thus become a separate sclerotium. These sclerotia resemble popcorn grains and are responsible for the popular name of the disease. Apothecia for the succeeding year develop in the spring about a month after ascospore discharge and originate from elements of a mantle, consisting of spermatiophores, which develops immediately beneath the outer tissues normally destined to become the fleshy portion of the mulberry fruits, and completely invests the young sclerotium.

The spermatia are produced in abundance and are extruded in a column at the tip of each sclerotium. The sclerotia fall to the ground during midsummer, become black, and remain dormant until the following spring, when each bears one or two perithecia. An increase in the size of the sclerotia, due to the presence of a

gelatinous covering on the sclerotial hyphae, is a sign that the pathogen is awaking from hibernation. The ascospores have similar envelopes, causing them to adhere, and yielding moisture for germination.

The apothecia, 1 to several from a sclerotium, have a cupulate to subcupulate disk, 4 to 12 mm. diameter, snuff-brown within, Prout's brown without; and a cylindrical, flexuous stipe, 15 to 42 mm. long by 1·5 mm. in diameter. The asci are cylindrical to cylindro-clavate, 104 to 123 by 6·4 to 8 μ. The reniform ascospores, 6·4 to 9·6 by 2·4 to 4 μ, have a caruncle on the concave surface. Filiform to cylindro-clavate paraphyses are present. The hyaline, ovate spermatia measure 3·6 by 2·4 μ.

S. shiraiana, parasitic on mulberry in Asia, belongs to the same genus and is renamed *C. shiraiana* (Henn.) Whetzel.

REID (W. D.) & BRIEN (R. M.). **Control of grease-spot of Passion-Vine.**—*N.Z. J. Sci. Tech.*, A, xxvii, 1, pp. 1–3, 1 fig., 1945.

On the basis of experiments conducted in 1942–3 and 1943–4, the following recommendations are made for grease spot (*Phytomonas passiflorae*) control in passion vines in New Zealand [*R.A.M.*, xviii, p. 331]. The vines should be pruned after harvesting to facilitate spraying, which should then be carried out immediately with 3–4–50 Bordeaux mixture. Between mid-March and mid-August at least four treatments at the same strength will be required monthly. In the first season's tests, the final incidence of fruit infection was reduced from 66·2 to 1 per cent. by six applications of Bordeaux mixture, while in those of the second year the final percentages of fruit disease for one, two, three, and four treatments were 1·2, 1·2, 0·3, and 0·2, respectively, compared with 10·3 in the unsprayed rows.

ARNAUD (G.). **Essais de traitement des maladies des plantes en 1941.** [Experimental treatments of plant diseases in 1941.]—*Ann. Épiphyt.*, N.S., viii, pp. 99–109, 1942. [Received September, 1945.]

The results of spraying tests carried out in 1941 in south-western France for the control of vine downy mildew [*Plasmopara viticola*] confirmed the view that as the copper sulphate content of copper mixtures is reduced below 2 per cent., so their effectiveness becomes progressively diminished. Even at 2 per cent. concentration, Bordeaux mixture fails to give complete control in some vineyards. If it is essential to economize in copper, it is best to make at least five or six applications, using about 6 hectol. mixture per ha. At a 2 per cent. concentration, this represents about 60 to 72 kg. copper sulphate per ha.

In tests against vine powdery mildew (*Uncinula necator*), three applications of sublimated sulphur gave almost perfect control.

In preliminary trials against wheat bunt [*Tilletia caries* and *T. foetida*] by Mlle Gaudineau, complete control was given in autumn sowings by seed treatments with cupric chloride dust (2 gm. per kg.), cupric powder C (with a copper oxide base), milk of copper K (used dry), and tetrabasic copper sulphate, as against an average infection of 22·55 per cent. in the untreated controls. With spring-sown seed, Bordeaux mixture (2 per cent.) permitted 0·21 per cent. infection, salicylic acid (suspension at 2 per 1,000) 0·23, formalin (2·5 per 1,000) 0·4, copper carbonate 0·5, cupric mixture (1 per cent. copper sulphate) with trisodic phosphate 0·6, and organo-mercuric product C 0·66, as against 18·9 per cent. in the untreated controls.

DARPOUX (H.). **Les bases scientifiques des avertissements agricoles.** [The scientific bases of agricultural spray warnings.]—*Ann. Épiphyt.*, N.S., ix, pp. 177–205, 3 figs., 2 diags., 10 graphs, 1943. [Received September, 1945.]

After pointing out that owing to the present shortage of fungicidal materials

spray warnings are of even greater importance than has been the case hitherto, and referring to the fact that in 1938 they allowed the number of treatments against vine mildew (*Plasmopara viticola*) applied in central France to be reduced to one, as against four or five in most years, the author states that the methods used are based on a knowledge of the biology of the parasite, of the action of environmental factors on its development, and of the susceptibility of the host in its different stages. This knowledge is built up by the agricultural research stations and is made use of by the spray-warning stations, which have also to take into account (*a*) meteorological factors (by daily observations and the forecasting, when possible, of certain of these factors), (*b*) the ratio of untreated to treated surface-area, and (*c*) statistical data concerning epidemics in earlier years. The author next deals in detail with each of these points in relation to vine mildew, potato blight (*Phytophthora infestans*), apple and pear scab (*Venturia inaequalis* and *V. pirina*, respectively), and certain insect infestations.

He concludes that the methods at present in vogue leave too much to empiricism and to the personal experience of those responsible for issuing the spray warnings. It would seem desirable to undertake an investigation of all the different methods of transmission or propagation of every disease against which spray warnings are or could be issued. A methodical, scientific study should be made of the effect of environmental factors on the biology of the organisms concerned, and the results reduced to laws and expressed graphically. Work should also be carried out on host susceptibility, and the critical stages of such susceptibility exactly determined. Finally, phenological data must be acquired and a relationship established between the development of a given disease and that of other parasites or higher plants. For example, in Bordeaux, several workers have noted that the first attack of *Gnomonia veneta* on plane trees precedes by a few days the first attack of *Plasmopara viticola* on vines. It appears that *G. veneta* reacts more quickly than *P. viticola* to climatic factors, and its presence may therefore serve to forecast the first invasion of vine mildew.

A bibliography of 40 titles is appended.

Brown (W.). **Plant pathology; teaching and research.**—*Ann. appl. Biol.*, xxxii, 2, pp. 89–96, 1945.

In his presidential address to the Association of Applied Biologists the author suggested a sound physical and mathematical background as a preliminary to undertaking biological studies. Meagre instruction in these basic sciences forms the chief objection to agricultural colleges as training-grounds for plant pathologists and, although the universities offer advanced courses on scientific subjects related to plant study, their urban location divorces students from intimate contact with growing plants. Good laboratory equipment and facilities for field study were essential and direct attack on field problems, with theoretical research harnessed in support, was the best practical way of keeping the vexed question of academic and applied research in proper perspective. Successful research meant increased plant production, lower prices and rising standards of living, or less land to grow the produce required—an important consideration for the national economy of so small a country as Great Britain. Such work should, therefore, be a national charge. Nevertheless, the organization of plant-pathological research left much to be desired. It was still no one's particular function to collate the work done on a particular problem and to devise steps for solving it; and there are many growers' problems to which no clear answer can be given, because the necessary research work has not been done. If, therefore, as seems likely, there is to be a continued intensification of agriculture in this country, the first requirement is a well-directed concentration on the problems which the practical grower puts before the scientific worker.

LAL (B. N.). **Plant-injection methods for the diagnosis of mineral deficiencies in Tobacco and Soya Bean.**—*Ann. Bot., Lond.*, N.S., ix, 35, pp. 284–295, 9 pl., 8 figs., 1945.

The author describes the injection methods most suitable for diagnosing mineral deficiencies in tobacco and soy-bean plants. Dye solutions were used for determining the best methods of injection and these methods were then used for injecting solutions containing compounds of nitrogen, phosphorus, potassium, magnesium, or iron into tobacco and soy-bean plants grown in sand and supplied with all essential elements except the one injected. The leaf-stalk method was most suitable for the former and the interveinal for the latter.

WALLACE (R. H.) & BUSHNELL (R. J.). **A simple and effective humidity control.**—*Plant Physiol.*, xx, 3, pp. 443–447, 2 figs., 1945.

The authors describe in detail an apparatus for regulating humidity in a chamber to within 1 per cent. An interesting feature of the apparatus is the humidistat, consisting of a bag of cellulose acetate, the expansion and contraction of which, with the rise and fall of humidity, respectively, moves a mercury switch controlling a current that activates the grid of a radio valve. This in turn starts or stops a motor feeding water to an evaporator.

Microanalysis of food and drug products.—171 pp., 67 figs., 37 diags., Washington, Federal Security Agency, Food and Drug Administration, 1944.

This circular (No. 1 of the above-mentioned organization) comprises sections on the detection and identification of moulds in citrus fruits, dairy products, dried chilli peppers, berry and stone fruits, and tomato products.

CHUPP (C.), STEVENS (N. E.), & MCCUBBIN (W. A.). **The value of plant quarantine disease surveys in extension, research and quarantine programs.**—*Plant Dis. Reptr, Suppl.* 152, 16 pp., 3 maps, 1945. [Mimeographed.]

The first author, discussing 'ways in which the emergency plant-disease prevention program aids extension' advocates that the plant disease surveyor should concentrate on distinct projects, obtaining data required by the extension specialist or the investigator, and not merely report diseases indiscriminately. The second author discusses 'research and plant disease surveys', and in particular the importance of disease forecasting. The third contribution concerns the 'relations of plant disease survey to quarantine and regulatory activities'.

AINSWORTH (G. C.) & BISBY (G. R.). **A dictionary of the fungi.** Second Edition. viii+431 pp., 138 figs., Imperial Mycological Institute, Kew, Surrey, 1945. 20*s.* or $4.60.

The chief changes and additions in the second edition of this dictionary [*R.A.M.*, xxiii, p. 140] are the listing of new genera from Supplements 1–10 (1940–44) of this *Review*, a new arrangement of the Phycomycetes in the light of Sparrow's work [ibid., xxii, p. 327], a systematic arrangement of the genera, and short biographical notes on an additional fifty important mycologists. Professor G. W. Martin has made changes in his key of the Families of Fungi and many minor alterations have been made throughout the text.

The mouldproofing of leather. Discussion by leather chemists.—*Leath. World*, xxxvii, 25, p. 432, 1945.

In the course of a paper on the mould-proofing of leather [*R.A.M.*, xxiv, pp. 331, 332] read by Miss Dempsey at a recent meeting of the London group of the Society

of Leather Trades Chemists, evidence was adduced for the damage of leather grain by moulds, which are probably, though not certainly, also responsible for injury to the corium fibres. In this connexion the importance of mould-proofing of leather intended for tropical service is emphasized. Vegetable-tanned material is the most liable to microbiological infection and chrome-tanned and chamois the least, while semi-chrome occupies an intermediate position. Para-nitrophenol, the most effective single fungicide for the purpose in view, should be added to the leather as late as possible in the manufacturing process. If incorporated in aqueous solution less is required than when added in the grease, at which stage 0·3 per cent. should be applied to vegetable and 0·1 per cent. to semi-chrome- or chrome-tanned. Leather articles not previously proofed should be sprayed with a 0·4 per cent. solution of para-nitrophenol or 1 per cent. beta-naphthol in 50 per cent. aqueous methylated spirits.

Mr. Atkin's work for various Service Departments had demonstrated the preservative efficiency of para-chlor-meta-cresol as an alternative to para-chlor-meta-xylenol or para-nitrophenol.

Snow (D.) & Watts (P. S.). **The effect of sulphanilamide and other bacteriostatic drugs on the growth of moulds.**—*Ann. appl. Biol.*, xxxii, 2, pp. 102–112, 4 figs., 1945.

This paper describes the testing of 50 isolates of *Aspergillus* and *Penicillium* spp. for their reaction to sulphanilamide, sulphonamide E.O.S. (a highly soluble compound containing 53 per cent. sulphanilamide, which is set free in solution), sulphapyridine, sulphamezathine, sulphaguanidine, propamidine and phenamidine. The moulds showed a high degree of specificity in their reactions. *Aspergillus* spp. proved more susceptible to the drugs than *Penicillium* spp. Concentrations of 1 in 8,000 of sulphanilamide, sulphonamide E.O.S., or propamidine inhibited most species of *A. glaucus*, but the other drugs had only slight effect on mould development. *A. versicolor* and *A. sydowi* exhibited like reactions to the drug concentrations, consistent with their morphological relationships. *Penicillium* spp. were generally unaffected by small concentrations and only partially inhibited by higher concentrations up to 1 in 125 of sulphonamide E.O.S. Propamidine was more effective against certain *Penicillium* spp., though not all were susceptible. Some of the moulds were slightly stimulated by small concentrations of the drugs.

Different strains of the same species sometimes showed different degrees of resistance or susceptibility to the drug concentrations. Two strains of *A. ruber* markedly resisted propamidine when incorporated on beer wort agar, while four other strains were susceptible when incorporated on the same medium.

Accelerated laboratory tests have established that the storage life of ground linseed cake [*R.A.M.*, xxiii, p. 397] incorporated with 0·2 per cent. sulphonamide E.O.S. can be doubled when stored at 85 and 80 per cent. relative humidity and at 25° C. Where the outside of the cakes was sprayed with a 2 per cent. solution of this drug the length of storage was increased three- to fourfold compared with untreated cakes stored at humidities between 100 and 80 per cent. Dipping of cheeses under laboratory conditions in a 2 per cent. sulphonamide E.O.S. solution before larding has more than doubled the storage life of cheeses stored at similar humidities.

Izrailsky (V. P.). **Antibiotic substances and bacteria control in animals and plants.**—*Успехи Современной Биологии* [*Advances in modern biology*], *Moscow*, xix, 3, pp. 358–371, 1945. [Russian.]

The author traces the growth of antibiotic research from Pasteur to the present day, and reviews the work of several investigators of the products of *Penicillium*

spp. and their properties, following the discovery of penicillin by Fleming in 1929. A bibliography of 76 titles, twelve by Russian authors, is appended.

THOM (C.). **Mycology presents penicillin.**—*Mycologia*, xxxvii, 4, pp. 460–475, 1945.

The author traces the mycological history of the discovery and development of penicillin up to the present time, when in the United States alone $20,000,000 is reported to be invested in industrial plants with a reputed production of 100 billions of Oxford units of penicillin per month by workers most of whom were totally unacquainted at the start with the mould problems involved.

WAKSMAN (S. A.) & SCHATZ (A.). **Strain specificity and production of antibiotic substances. VI. Strain variation and production of streptothricin by Actinomyces lavendulae.**—*Proc. nat. Acad. Sci., Wash.*, xxxi, 7, pp. 208–214, 1945.

A culture of *Actinomyces lavendulae* in the authors' laboratory was found to possess distinct antibiotic properties, and to produce streptothricin [*R.A.M.*, xxi, p. 248]. Variants differing in their capacity to produce this antibiotic substance were readily isolated from it. These variants also differed in other cultural and physiological characters, and those that did not form aerial mycelium failed to produce streptothricin.

BOSE (S. R.). **Anti-bacterial action of 'polyporin' against typhoid, cholera, dysentery, and B. coli.**—*Nature, Lond.*, clvi, 3954, p. 171, 1 fig., 1945.

Further trials with polyporin (filtrate of a *Polyporus* sp. in Czapek-Dox medium, P_H 7) were made *in vitro* in plate cultures with typhoid, cholera, and dysentery organisms, and *B*[*acterium*] *coli*, and clear lytic zones were obtained. A sodium salt of polyporin had greater potency than the crude filtrate. In broth cultures of typhoid bacillus and *Staphylococcus aureus* the sodium salt produced lytic action in about 20 hours [cf. *R.A.M.*, xxiv, p. 158]. Sporophore extracts from the dried fruit body had distinct bacteriolytic action. Animal experiments with polyporin showed that it was entirely non-toxic. It retained its potency at room temperature for about a month when kept in a sterile condition.

RAYNER (M[ABEL] C.). **Origin of toxicity to fungi in Wareham Heath soil.**—*Nature, Lond.*, clvi, 3954, p. 174, 1945.

Referring to the discovery of antibiotic activity by species of *Penicillium* in Wareham soil [*R.A.M.*, xxiv, p. 332], the author points out that her observations suggest that the distribution and abundance of the soil *Penicillium* spp. present are sporadic throughout the experimental area, and may, perhaps, be influenced by seasonal conditions. In the present state of knowledge it is an open question whether gliotoxin as such is the immediate cause of the observed phenomena in Wareham soil, or whether it is only one of various microbiological disturbances conducing to soil infertility.

Boletus bovinus was the only known mycorrhiza-former of pine [ibid., xxi, p. 299] and spruce initially present throughout the area. *B. elegans* appears in adjoining woods of larch, of which it is a mycorrhiza-former [ibid., xxi, p. 388]. *Mycelium radicis nigrostrigosum* has not been observed, unless introduced in soil inocula, though abundant as a mycorrhiza-former in woods of Scots pine adjoining the area [ibid., xxii, p. 266]. *Phoma radicis callunae* is the mycorrhiza-former of *Calluna vulgaris*, a natural dominant on Wareham heath. The differential susceptibility of these mycorrhizal fungi to gliotoxin, as recorded by Dr. Brian, agrees with all observations and facts relating to growth activity of those present in the experimental area, and accords with expectation in the case of those not present.

FRIES (N.). **Die Einwirkung von Adermin, Aneurin und Biotin auf das Wachstum einiger Ascomyceten.** [The effect of adermin, aneurin, and biotin on some Ascomycetes.]—*Symb. bot. upsaliens.*, vii, 2, 73 pp., 10 graphs, 1943. [English summary.]

This expanded, fully tabulated and documented survey of the author's studies on the response of certain Ascomycetes to the growth substances adermin (vitamin B_6), aneurin (vitamin B_1), and biotin embodies the experimental results already briefly noticed from another source [*R.A.M.*, xxii, p. 398].

FRIES (N.). **Untersuchungen über Sporenkeimung und Mycelentwicklung bodenbewohnender Hymenomyceten.** [Investigations on spore germination and mycelial development of soil-inhabiting Hymenomycetes.]—*Symb. bot. upsaliens.*, vi, 4, 81 pp., 19 figs., 1 diag., 1 graph, 1943. [English summary. Received August, 1945.]

The principal object of the investigations herein fully described and tabulated was the inducement of spore germination in Swedish soil-inhabiting species of *Tricholoma*, *Amanita*, *Paxillus*, *Boletus*, *Hydnum*, and *Craterellus* by means of activating organisms, mostly *Torulopsis sanguinea*, which proved superior for the purpose to the wild yeast 'X' [*R.A.M.*, xxii, p. 398]. The activator was incorporated in the Petri dish cultures in which the spores were grown, mostly on malt or glucose tartrate agar. Ten out of 11 species of *Tricholoma* germinated, of which six required the aid of *Torulopsis sanguinea*. Even in the most fruitful species, *Tricholoma imbricatum* and *T. pessundatum*, the germination percentage was very low, in five test species it did not exceed 1 per cent., while in *T. album* and *T. rutilans* it was under 0·1. *T. nudum* gave uniformly negative results, even in the presence of the activator. A number of the species under observation are mycorrhiza-formers [ibid., xxii, p. 104].

No germination occurred in any of the *Boletus* spp. tested without activation by *Torulopsis sanguinea*. *Coenococcum graniforme* [*C. geophilum*, loc. cit. and Wakefield and Busby, *Trans. Brit. mycol. Soc.*, xxv, p. 126, 1941] enabled *B. bovinus*, *B. luteus*, and *B. variegatus* to germinate on glucose tartrate agar plus 1 γ vitamin B_1 per plate, *Mycelium radicis atrovirens* exerted a comparable effect on *B. luteus* and a less marked one on *B. variegatus*, while *Pythium aphanidermatum* also stimulated germination in the last-named species only. *B. luteus* and *B. variegatus* likewise responded favourably to the addition to glucose tartrate agar of fruit body extracts of *A. muscaria*, *B. variegatus*, *Hygrophorus erubescens* (*B. variegatus* only), and *Lactarius rufus*. A study of the comparative duration of viability in *Boletus* spores showed this property to be retained for the longest period (300 days and upwards) by *B. luteus* and *B. viscidus*, and for the shortest (maximum of 170) by *B. bovinus*. In general, storage at — 10° C. prolonged the period of viability.

Of the other fungi tested *A. mappa*, *Paxillus involutus*, *Hydnum repandum*, *H. imbricatum*, and *Craterellus lutescens* all required the presence of the activator for germination.

Service and regulatory announcements, January to March, 1945. Announcement relating to black stem rust quarantine (No. 38).—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 1–2, 1945.

Under this (fourth) revision of *Circ. B.E.P.Q.* 385, effective as from 24th January, 1945, *Mahonia dictyota*, *M. gracilis*, and *M. pinnata*, which have been proved to be immune from, or highly resistant to, black stem rust [of cereals: *Puccinia graminis*], are added to the list of barberries allowed to be shipped into or between the protected States under permit [*R.A.M.*, xxiv, p. 304].

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BJÖRKMAN (E.). **Über die Bedingungen der Mykorrhizabildung bei Kiefer und Fichte.** [On the conditions of mycorrhiza formation in Pine and Spruce.]—*Symb. bot. upsaliens.*, vi, 2, 190 pp., 34 figs., 28 graphs, 1942. [English summary. Received August, 1945.]

The writer's field studies failed to yield any clue to the wide and baffling discrepancies in mycorrhizal development on pine and spruce in Sweden [*R.A.M.*, xxii, p. 266]. The results obtained in soil culture experiments indicated that light is the factor of paramount importance in mycorrhizal formation, which was favoured by an increase of illumination up to the maximum value tested, i.e., half that available in the open. No mycorrhiza developed at $\frac{1}{16}$ or even, in soil with high nitrogen content, at $\frac{1}{8}$ of full light. Extreme nitrogen or phosphorus deficiency was found to impede mycorrhizal growth, but a moderate shortage of one or other of these elements is a condition of infection [ibid., xvii, p. 126]. When the available nitrogen content was not too high, mycorrhizal infection was favoured by all additions of phosphorus tested. In aseptic flask cultures of pine seedlings inoculated with *Rhizopogon roseolus* or *Boletus variegatus*, moderate additions of glucose promoted mycorrhizal invasion, notably in weak light. The roots of seedlings grown under conditions conducive to mycorrhizal development contained larger amounts of reducing substances and reacted much more intensively to the potassium iodide starch test than those deprived of the factors necessary for infection.

On the basis of these data it is concluded that the mycorrhizal fungi enter the host roots in search of soluble carbohydrates [ibid., xix, p. 37], which will only accumulate in sufficient quantities where the moderate scarcity of an essential nutrient prevents rapid photosynthesis. This theory would account for the complex interrelationships existing between mycorrhizal infection, light, and available nitrogen and phosphorus, and explain all or most of the diversities of mycorrhizal habit observed among conifers, both under natural and controlled conditions. It would further appear that nodule development in alders [cf. ibid., xxi, p. 34] and legumes is influenced by a similar interplay of environmental factors.

GÄUMANN (E.) & JAAG (O.). **Über induzierte Abwehrreaktionen bei Pflanzen.** [On induced defence reactions in plants.]—Reprinted from *Experientia*, i, 1, 3 pp., 1 fig., 1945.

The roots of *Loroglossum* (*Himantoglossum*) *hircinum*, an orchid growing on rocky heathland in the Jura Mountains, Switzerland, are infected by a mycorrhizal fungus, *Rhizoctonia repens* [*R.A.M.*, xxii, p. 171], which does not normally occur in the rhizomes. When the fungus is grown on a suitable medium in proximity to a fair-sized piece aseptically excised from a rhizome, the former is halted in its advance towards the latter, evidently by the diffusion of an anti-fungal substance. Rhizomes killed by chloroform narcosis or cold prior to testing failed to react defensively to the fungus, which completely invested them. This observation is interpreted as indicating that the anti-fungal substance originates as a true

defensive reaction to the advancing metabolic products of the invader and is not present as a natural ingredient of the rhizome from the outset.

Such defensive reactions are not confined to the rare *L. hircinum* but occur also in common species, such as *Orchis militaris* and *O. morio*, the rhizomes of which are similarly free from fungal infestation.

FERNOW (K. H.). **Relation of sample size to accuracy.**—*Amer. Potato J.*, xxi, 8, pp. 229–234, 1944.

In this paper the author discusses the sampling technique of seed-potato inspectors and tabulates the probability of obtaining a given number of diseased plants in a sample of given size from a stock containing a given percentage of disease, and the minimum and maximum percentages of diseased tubers likely to be found in samples of varying size from stocks containing given percentages of disease.

MORGAN (E. T.). **The use of the tuber-unit plots in the production of seed Potatoes.**—*J. Dep. Agric. W. Aust.*, xxii, 1, pp. 70–74, 2 figs., 1945.

The tuber-unit system was introduced by the author in 1937 with a view to improving the system of roguing potatoes, subject to Government inspection under the Certified Seed Potato Scheme. Under the unit system, tubers, sufficiently large to allow four or more seed pieces to be cut from one potato, are cut into sets, those from each tuber, comprising a unit, being planted consecutively about 15 in. apart along the row. A double spacing of 30 in. should be left between each succeeding unit. Plants should be carefully inspected during growth and should any seed piece of the unit produce a diseased plant, the whole unit is discarded.

Tuber-unit seed-potato plots have the following advantages: (1) greater certainty of detecting virus-diseased plants by reason of a number of such plants being together; (2) earlier detection of such diseases, allowing roguing to be undertaken sooner and thereby lessening the risk of transmission; (3) limiting the points of infection for the transmission of the disease.

HUNTER (J. G.) & M'GREGOR (A. J.). **An investigation of diseases resulting from inadequate nutrition of the Potato plant.**—*Scot. J. Agric.*, xxv, 3, pp. 176–178, 1945.

Notes are given on three types of disease observed on potatoes in Scotland. In the first, the plants were dwarfed, and the young leaves had a slight upward roll, which became more marked as the plants grew older. In August, when the haulms were about 6 in. high, the older leaves showed yellow and brown blotches and dead patches. This marking was most apparent at the margins and tips, though in the oldest leaves it was also present between the veins. The affected leaves died prematurely and fell off. The younger leaves were a pale, unhealthy green. The tubers were small and the yield was reduced. Analyses of diseased plants and of the soil indicated that the condition was primarily due to a serious calcium deficiency in the soil, and was aggravated by low magnesium. Treatment of the highly acid soil with ground shell lime greatly increased the yield.

In the second type of disease, growth was very poor, in spite of adequate supplies of potato manure. The haulms in August were only 12 to 18 in. high and very bare, as a result of the premature death and shedding of many of the older leaves. In the early stages, the leaf margins had a slight upward curl. Yellowing of the margins and tips soon set in, and changed to an orange-yellow colour which extended from the margins to the veins and midribs. In some cases, the only green parts left on a leaf were small patches between the veins. Brownish-purple areas were generally present between the veins, sometimes surrounded by an almost normal green colour, and at others by yellow tissue. Brown, dead patches were

often present on the leaves. The yield was considerably reduced. The affected leaf blades contained only one-seventh as much magnesium as did healthy ones, and the disease is attributed to magnesium deficiency. This soil was also very acid. The best method of preventing magnesium deficiency is to apply lime (particularly dolomitic limestone) or to use manure; alternatively suitable dressings of magnesium salts can be applied.

In the third type of disease, the plants were stunted, and parts of the leaves were yellow-green, though no marginal effect was noted. The extreme edges of the leaves were brownish, with a slight upward curl. Tuber yields were reduced. Affected plants had an abnormally low nitrate content. Control consists in applying nitrogenous manures.

SANFORD (G. B.). **Common scab of Potato in dry and wet soils.**—*Sci. Agric.*, xxv, 9, pp. 533–536, 1 fig., 1945.

An experiment is described in which batches of soil, containing water to approximately 19, 22, 26, 30, 35, and 39 per cent. of their water-holding capacity, were steam-sterilized and aseptically poured into sterilized metal containers with holes and glass windows in their covers. These were about half filled, and a narrow band of soil next to the window was seeded with a small quantity of a soil-spore mixture obtained by shaking a little soil over a matured culture of *Actinomyces scabies*. The containers were then filled up, the holes plugged with cotton, and the edges of the glass windows sealed with paraffin wax. The incubation temperature was 23° C. The first soil of this series was too dry for plant growth and the last one too wet to handle. Comparative ratings of the vegetative growth of *A. scabies* were made on the fifth, sixth, and ninth days after seeding with spores, a value of 10 representing the best growth on each date.

Five days after seeding, growth in the dry soil (19 to 26 per cent. moisture) was 30 per cent. poorer than that in the soil of optimum or over-optimum moisture (30 and 35 per cent. moisture, respectively), but about 70 per cent. better than in the wet soil (39 per cent. moisture). One day later, growth in the dry soil was only 25 per cent. better, and after three days the situation was reversed, with growth 12 per cent. better in the wet soil. The fungus appears to grow surprisingly well in a soil too dry for plant growth. It is concluded that in the absence of effective antagonism from associated saprophytes, severe scab may occur in soils high in moisture content, as well as in drier soils.

GÄUMANN (E.) & HÄFLIGER (E.). **Der Einfluss der Bodentemperatur auf die Entwicklung und den Schorfbefall der Kartoffelknollen.** [The influence of the soil temperature on the development and scab infection of Potato tubers.]—Reprinted from *Phytopath. Z.*, xv, 1, 23 pp., 1 fig., 16 graphs, [undated, received September, 1945].

Studies on the influence of the soil temperature on potato tuber development and scab (*Actinomyces scabies*) infection have been carried out by various workers and summarized, e.g., by Wollenweber (in Sorauer's 'Handbuch der Pflanzenkrankheiten', Part II, Fifth edition [*R.A.M.*, xi, p. 527]) and Roemer *et al.* [ibid., xviii, p. 196]. According to these authorities, the optimum for tuber infection lies between 25° and 28° C., while the pathogen ceases to grow at 8° though developing freely up to 38°. Field observations in Switzerland, however, gave rise to doubts as to the universal applicability of these data and suggested the possibility of the intervention of other physiologic races of the fungus in mountainous countries. Experiments were therefore conducted by Gäumann and Riethmann's method (*Phytopath. Z.*, xi, pp. 617–631, 1938) to determine the effect of soil temperatures on host and parasite, using Swiss mountain material of the early variety Bintje in 1942 and of the medium-late Ideal in 1943.

The optimum soil temperature for tuber yield was found to lie within the broad range of 13° to 26°. Inside this range both the number of tubers per plant and their average weight reached a maximum. The influence of soil temperature was noticeable in the periderm, and especially the primary cortex, which (except for the outermost layer) constitutes a reservoir for starch. Below 27° the starch-free zone measures less than 100 μ in thickness, above 30° it rapidly rises to 300 μ, and at the upper limit of 34° the entire tuber is practically devoid of starch. The contents both of glucose and starch attain a well-marked optimum at 20° to 22° and then sink rapidly, especially at higher temperatures.

The minimum, optimum, and maximum temperatures for the growth of the strain of *A. scabies* used in the trials were 3°, 24°, and 33°, but scab infection assumed its maximum extent and virulence at a suboptimum for the pathogen (10° in the case of Bintje and 13° in that of Ideal). These temperatures coincided with the greatest productivity of the tubers, indicating the preference of the parasite for plants with a high degree of vitality.

TAYLOR (G. G.). **Trials with Bordeaux mixture, copper oxychloride, and copper oxide sprays for control of late-blight (Phytopthora infestans) of Potatoes.**—*N.Z. J. Sci. Tech., A*, xxvii, 1, pp. 4–8, 1 fig., 1945.

Spraying with Bordeaux mixture 3–4–50 and the copper oxychlorides, cuprox and oxicop (5 lb. in 100 gals.), effectively combated late blight (*Phytophthora infestans*) in King Edward potatoes in the Auckland district of New Zealand from 1940 to 1943. No advantage was derived from the use of a higher concentration (5–4–50) of Bordeaux, or from the admixture of cottonseed oil with the fungicide. There was some evidence that perenox (5–100) caused yield reductions through spray damage effects.

MELHUS (I. E.). **Late blight forecasting service.**—*Phytopathology*, xxxv, 6, pp. 463–479, 1 graph, 1945.

In 1943, potato late blight [*Phytophthora infestans*] forecasting [*R.A.M.*, xvi, pp. 514, 832; xvii, p. 59, *et passim*] was undertaken by a subcommittee of the 'War Service Committee of the Upper Mississippi Valley' Plant Pathologists in consequence of an estimated loss of 25,000,000 bushels in the previous year, which demanded prompt co-operative action on the part of all States and the two Prairie Provinces of Canada lying within the region. Temperature and rainfall records from 1941 to 1944, inclusive, are presented for nine States, while in Missouri, Kansas, and Saskatchewan the incidence of infection was too low to justify any attempt at the correlation of meteorological data and the development of the pathogen. However, even allowing for incompleteness and possible errors in the records, it is significant that the destructiveness of late blight outbreaks can be predicted by a study of the influence of temperature and precipitation on the development of the causal organism.

During the period under review, a temperature of 70° F. represented the maximum conducive to luxuriant initial growth of the fungus, and in no case did the disease assume a virulent character where the mean temperature in June and July exceeded this figure, which was therefore of great assistance in the formulation of a basis for predictions as the reports arrived from committee members. The forecasting was based upon weekly weather reports, and in general this basis was satisfactory for forecasts of the prevalence and severity of *P. infestans* throughout the growing seasons of the four years covered by the survey.

In comparison with 1941 and 1942, 1943 and 1944 were marked by a noteworthy increase in control practices. In North Dakota, for instance, the number of spraying and dusting machines rose from 600 to 1,200 during the period of the investigations, and a similar upward trend was observed in other States. In

Minnesota six aeroplane dusters were operating in 1944. These vigorous efforts at combating the pathogen were doubtless in part responsible for its diminishing intensity of attack in the two later years.

JOHANSEN (GUDRUN). **Indsunkne Smaapletter paa Kartoffelknolde.** [Small, sunken spots on Potato tubers.]—*Tidsskr. Planteavl*, xlvii, pp. 675–682, 1943. [Received August, 1945.]

Of recent years, potato tubers in Denmark have been observed bearing hard, dry spots, ranging from pale through dark brown to greyish-black and sharply delimited from the healthy portion by a narrow, dark brown, moist zone consisting of suberized tissue. The trouble, which threatens to assume a virulent form, is usually only discovered in the spring, when the tubers are brought in from the clamps, and even then the symptoms may not appear until several weeks have elapsed. Although it is considered highly probable that the disease is caused by *Alternaria solani* [see next abstract] the fungus had not, at the time of writing, actually been isolated from infected material, very likely because of the simultaneous presence in the tissues, at this advanced stage of decay, of numerous secondary organisms, including *A. tenuis*, which overrun the original pathogen.

Important contributions to the study of early blight in other countries are summarized, with special attention to those of Klaus in Germany [*R.A.M.*, xx, p. 417].

STAPEL (C.). **Kartoflens Bladpletsyge.** [Potato leaf spot disease.]—Reprinted from *Ugeskr. Landm.*, *1943*, 29, 2 pp., 1943.

Potato leaf spot [early blight: *Alternaria solani*], which has assumed increasing importance of recent years in Denmark [see preceding abstract], was effectively combated on King Edwards at the State Phytopathological Experiment Station in 1940 by two applications of 2 per cent. Bordeaux mixture, the first on 23rd July and the second on 16th August, at a dosage of 1,600 l. per ha., the incidence of infection being reduced from 91·3 to 23·1 per cent. and the tuber yield increased from 518·7 to 538·5 hectokg. per ha. In another test on the Majestic variety the same procedure was followed, except that the fungicide was used at a dosage of 2,000 l. per ha., with a resultant drop in the amount of early blight from 91 to 15·3 per cent. and a corresponding increase in yield from 440·4 to 472·6 hectokg. per ha. In 1941 Bordeaux mixture (2 per cent.) was again applied to Majestics on 19th July and 18th August at 1,200 l. per ha., effecting a reduction in the incidence of *A. solani* from 100 to 64·3 per cent. and raising the yield from 308·1 to 347·5 hectokg. per ha. In this case the attack commenced early, and by 5th August two-thirds of the leaves were already infected. The 13 per cent. improvement in yield is attributed largely to the control of a late but virulent outbreak of blight [*Phytophthora infestans*], which was negligible in 1940, when the increase in production from spraying was proportionately small.

HOUSTON (B. R.). **Culture types and pathogenicity of isolates of Corticium solani.**—*Phytopathology*, xxxv, 6, pp. 371–393, 5 figs., 1 graph, 1945.

On the basis of cultural characters and observed pathogenicity, 52 isolates of *Corticium solani* were selected from 260 collections on 15 Californian crop plants for further pathogenicity studies [*R.A.M.*, xx, p. 391; xxiv, p. 286, *et passim*]. They were divided into three culture types, of which (A) was characterized by a heavy, stroma-like layer on the surface of the medium, nearly white at first, turning pale drab-grey to light drab (Ridgway), often convoluted; natal-brown sclerotia, frequently radiating out from the point of inoculation; a sparse, white to cinnamon aerial mycelium; a rapid growth rate (1 to 1·8 mm. per hour); and commonly a distinct darkening of the medium; (B) by no well defined, superficial, stromatic layer; few, natal-brown, globular sclerotia, 1 to 4 mm. in diameter; very profuse,

pale olive to sayal-brown mycelium; a moderate growth rate (0·6 to 0·8 mm. per hour); and no darkening of the substratum; (C) by a slight, vinaceous-buff, later wood-brown, superficial stromatic layer; natal-brown, globular sclerotia with a very irregular surface, often united into groups up to 15 mm. in diameter, while the scattered individuals measured 1 to 5 mm.; little or no aerial mycelium; a moderate to slow growth rate (0·5 to 0·7 mm. per hour); and moderate or no darkening of the medium. The hosts of type (A) comprised beans (pink (*Phaseolus vulgaris*), Lima [*P. lunatus*], and Mung [*P. mungo*]) [ibid., xxiv, pp. 88, 261], cotton, Blackeye cow-peas, fenugreek [*Trigonella foenum-graecum*], potato, rhubarb, spinach, vegetable marrow, sugar beet, and tomato; (B) was isolated exclusively from dry-rot cankers on sugar beet [ibid., xx, p. 391]; and (C) was collected on lucerne, asparagus, pink beans, celery, potato, strawberry, and tomato.

The results of tests to determine the effects of temperature on 25 isolates agreed in the main with those of other workers on *C. solani*. The optimum in the majority of cases was 28° C. and the maximum 42°, but for the type (C) isolates the corresponding figures were 25° and 33°, respectively, a differential feature placing the representatives of this group in a separate temperature category.

The pathogenicity of 26 isolates of type (A), 9 of (B), and 13 of (C) was tested on lucerne, cotton, spinach, sugar beet, and tomato, and the following average percentages of infection were secured with the three groups: (A) 82, 79, 64, 73, and 53, respectively; (B) 10, 4, 1, 7, and 3; and (C) 7, 5, 5, 7, and 2. In another series on bean the average percentages of diseased seedlings inoculated with the same isolates of (A), (B), and (C) were 86, 17, and 5, respectively. Thirteen isolates of (A), five of (B), and eight of (C) were also tested for their action on White Rose potato tubers, which gave rise to 42, 2, and 13 per cent. diseased shoots, respectively. Sclerotial production was abundant only on the stems and tubers infected with the (C) isolates, of which potato is the most common natural host, though the effects of (A) were more destructive.

Inoculation tests with 26 isolates of *C. solani*, of which 11, 6, and 9 fell into the (A), (B), and (C) groups, respectively, on sugar beet (*a*) roots and (*b*) crowns resulted in the following average infection percentages: (A) 85 and 65 on (*a*) and (*b*), respectively; (B) 97 and 17; and (C) 19 and 4. Members of group (B) were only able to enter through the enlarged roots, unlike the majority of (A) isolates, which also attacked the petioles and crown tissues. The relatively low incidence of disease induced by most of the (C) strains, which in nature are primarily associated with potato black scurf, marks them off as a distinct group in respect of pathogenicity to sugar beet, as already shown by Le Clerg [loc. cit.].

On the other hand, one of the (A) isolates from potato caused severe injury to sugar beet (100 and 93 per cent. on roots and crowns, respectively).

It is apparent from these observations that the cultural characters of *C. solani* isolates are more important in the prediction of their potential injuriousness to specific hosts than the source of their derivation.

GARRARD (E. H.). **A storage rot of Potatoes caused by a fluorescent organism resembling Pseudomonas fluorescens (Flügge) Migula.**—*Canad. J. Res.*, Sect. C, xxiii, 3, pp. 79–84, 5 figs., 1945.

The author describes the isolation from potatoes, dug on allotments near Toronto, believed to have been stored satisfactorily and found rot-infected when sliced for cooking, of an organism considered to belong to a subgroup [*R.A.M.*, xiv, p. 16] of *Pseudomonas fluorescens*, consisting of non-plant pathogens and some weak parasites, and not unlike Lacey's strain 221 [ibid., xi, p. 700], isolated from potato tuber ring disease, and *Bacterium xanthochlorum* [*P. xanthochlora*; ibid., v, p. 574].

On examination the allotment tubers were found to be flabby; some bore no outward signs of infection, others had surface discoloration or showed scab, but

no cracks. A hard, black rot, a corky vascular decay, and brown to black areas with cracks and cavities in some cases, radiating towards the outside, were disclosed on cutting up the potatoes. When freshly cut, the tubers were hard, with little exudate, no ropiness, and no pronounced smell. Rotting at room temperature was not nearly so rapid as when kept at 5° C.

Although the symptoms resembled those of *Corynebacterium sepedonicum* [ibid., xxiv, p. 201], that organism was not found on Burkholder's medium [ibid., ix, p. 695], but plates supporting nutrient agar produced flat, greyish-white, circular to lobate colonies of non-sporing, Gram-negative, aerobic rods, measuring 1·5 to 3 by 0·7 to 0·9 μ, motile by one to three polar flagella [ibid., v, p. 574], and grouped singly or in pairs. The surrounding medium was distinguished by a glistening, yellowish-green fluorescence.

Inoculation of the isolated organism on sterile potato slices produced extensive black rot in 24 hours at 5°, with a slighter effect at 18° and 25°. The disease also developed in sound, whole tubers inoculated through a stab made by a sterile needle. After successive transfers on culture media, the organism lost its pathogenicity within six months. This fact and its virtual identity with *P. fluorescens* in culture have restrained the author from classifying the organism as a separate plant pathogen. It is suggested that the potatoes forming the subject of this enquiry were impaired for resistance to the organism by storage under home conditions.

CRÉPIN (C.) & ARNAUD (G.). **Les maladies de la Pomme de terre.** [Potato diseases.] —67 pp., 18 col. pl., 7 figs., Paris, Ministère de l'Agriculture et du Ravitaillement, 1943. [Received September, 1945.]

In this publication, based on earlier ones by Ducomet and Foëx [*R.A.M.*, iii, p. 98], and Ducomet, Foëx, and Alabouvette [ibid., xiv, p. 786], the authors, with the collaboration of Bustarret, Lansade, and Limasset, and of Mme Huan for the coloured plates, give a full, semi-popular account intended to be of use to growers, of the chief potato diseases occurring in France (including *Erysiphe cichoracearum*, an undetermined bacterial wilt, and *Sclerotinia libertiana* [*S. sclerotiorum*]), their symptoms, manner of transmission, and control. A key to the different diseases is provided.

LIMASSET (P.) **Les maladies à virus de la Pomme de terre.** [Potato virus diseases.]— *Circ. Lig. nat. Lutte Ennem. Cult.*, 8 pp., May–June, 1941. [Received September, 1945.]

In this address, delivered on 15th May, 1941, in Paris, the author discusses in semi-popular terms the question of potato virus diseases, with special reference to their symptoms, effects, transmission, and control. The diseases dealt with include the mosaic group (virus Y, causing 'bigarrure' [streak] and 'chute des feuilles' [leaf-drop streak], virus A, virus X, and the virus causing 'mosaïque aucuba' or 'panachure infectieuse' [aucuba mosaic]), the 'enroulement' [leaf roll] group, which comprises only one virus, but the one that causes the most damage in France, the 'tubercule en fuseau' [spindle tuber] group, comprising two viruses confined to the American continent, and the 'jaunisses' [yellows] group, including the potato 'balai de sorcière' [witches' broom] virus, found in the United States and Russia.

SAHA (J. C.). **Diseases of Rice and methods for their control.**—*Sci. & Cult.*, xi, 1, pp. 13–20; 2, pp. 69–74, 3 figs., 1945.

Of the rice diseases listed with descriptive notes in this summary of the main information available on the subject, the following are definitely known to occur in India: false smut (*Ustilaginoidea virens*), bunt (*Tilletia* [*Neovossia*] *horrida*), *Sclerotium oryzae*, *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] (the virulent

epidemics of which in 1942 were a contributing factor in the Bengal famine of 1943), 'pan-sukh' [*R.A.M.*, xvi, p. 833], straighthead [ibid., xxi, p. 128], leaf smut (*Entyloma oryzae*), Udbatta disease (*Ephelis oryzae*), the agent of total destruction of the inflorescences, root rot (the 'mentek' of the Dutch East Indies [ibid., xvi, p. 339]), *Fusarium* sp., and blast (*Piricularia oryzae*).

The 'myitpo' disease, reported from irrigated tracts in the dry Shwebo district of Burma, appears in patches 30 to 100 ft. or more in diameter, on which the plants are stunted, yellow, and desiccated: its etiology is obscure, but a biological agency is suspected. Control may be effected by the application of soluble phosphatic fertilizers.

LINDEBERG (G.). **Über die Physiologie ligninabbauender Boden-Hymenomyzeten. Studien an schwedischen Marasmius-Arten.** [On the physiology of lignin-decomposing soil Hymenomycetes. Studies on Swedish species of *Marasmius*.]—*Symb. bot. upsaliens.*, viii, 2, 183 pp., 24 graphs, 1944. [English summary.]

The capacity of 14 species of *Marasmius*, mostly common occupants of the soil of Swedish hard- and softwood forests, for litter (chiefly lignin and cellulose) decomposition was investigated by culturing the fungi for six to seven months on sterilized pine needles, beech and aspen leaves, and *Glyceria maxima* straw, and determining the dry weight of the substrata and their contents of lignin, cellulose, and furfural-yielding substances at the beginning and end of the experimental period.

All the species except *M. chordalis* decomposed lignin more or less extensively, *M. putillus*, *M. scorodoneus*, *M. peronatus*, and *M. androsaceus* being the most active in this respect on pine needles (48 to 59 per cent.), *M. alliaceus*, *M. foetidus*, and *M. ramealis* on beech leaves (67 to 72 per cent.), and *M. oreades* on straw (63 per cent.). Cellulose was decomposed by all the species, some of which disintegrated 80 to 90 per cent. of the substance in all the substrata except pine needles; here the process was evidently more difficult, and in no case did the amount of disorganization exceed 36 per cent. All the species severely attacked the furfural-yielding components of the litter.

Nitrate and organic nitrogen were assimilable by all the species, but *M. fulvobulbillosus* was the only one capable of absorbing ammonium nitrogen.

CRANDALL (B. E.). **Nursery root and collar rot of Cinchona and root rot of Canavalia caused by Sclerotium rolfsii.**—*Plant Dis. Reptr*, xxix, 20, pp. 536–537, 1945. [Mimeographed.]

This paper records the isolation of a *Sclerotium* sp., possibly *S. rolfsii*, from dying Ledger type *Cinchona officinalis* transplants observed in the nursery. Scattered dying patches, associated with a cluster of dead or dying seedlings, were in obvious contrast to transplants killed by die-back or root rot (*Phytophthora* spp.). An examination of the soil surrounding the diseased trees disclosed abundant production of the sclerotia of the fungus. The elimination of diseased and adjacent trees and the removal of a portion of the bed surface are said to have checked the spread of the disease, which is believed to be the first record of southern blight (*S. rolfsii*) attacking *Cinchona* in any part of the world.

MARTÍNEZ (J. B.). **El Agárico blanco ('Ungulina officinalis' Pat.) en los Cedrales del Marruecos español.** [The white Agaric ('*Ungulina officinalis*' Pat.) in Spanish Moroccan Cedar plantations.]—*An. Jard. bot. Madr.*, iv, pp. 75–115, 12 pl., 1944. [German, French, English, and Italian summaries.]

Specimens of *Ungulina officinalis*, of which *Fomes officinalis* [*R.A.M.*, xxii. p. 231] is listed as one of the nine synonyms, were collected on *Cedrus atlantica*

in Spanish Morocco and subjected to a critical examination by the author, who differentiates four hyphal types within the fruit body, namely, ordinary hyphae (not staining with blue lactic acid), vermiform (reacting positively to the same stain), fibriform (giving a negative or faint response), and multiform (taking a vivid stain). The most abundant growth was made on potato dextrose agar at P_H 7, but satisfactory development also occurred on sour cherry juice agar at P_H 4. In view of the pharmaceutical importance of the fungus and its prevailing scarcity on the market, further investigations are planned to determine the possibilities of (*a*) its procurement from stands of *Abies pinsapo* in Spain, *A. maroccana* and *C. atlantica* in Spanish Morocco, and *Pinus canariensis* in the Canary Islands, and (*b*) artificial production by inoculation of the coniferous hosts.

RAMSBOTTOM (J.). **Reasons for name-change and the stability of names.**—*Ann. appl. Biol.*, xxxii, 2, pp. 181–183, 1945.

Opening a discussion on biological nomenclature [*R.A.M.*, xxiv, p. 166], the author remarked that stability in nomenclature is a desideratum, and that economic biologists appear to desire to prevent name-changes which, though sound in principle, are objectionable in practice. While the conservation of generic names is beneficial, there is no support by botanists for the proposal to conserve specific names. Absolute stability of nomenclature cannot be reconciled with taxonomic progress. Lists of standard names could not prevent changes based on new systematic knowledge, and would not be regarded as satisfactory by systematists.

BISBY (G. R.). **What are the mycologists doing about nomenclature?**—*Ann. appl. Biol.*, xxxii, 2, pp. 183–184, 1945.

After commenting on the undue length of the International Rules of Botanical Nomenclature, the author suggests that they could be somewhat simplified, and that it might be useful to have a shorter, supplementary code for fungi. The views of plant pathologists, industrial mycologists, and others, should be obtained regarding the capitalization of epithets and the possible conservation of important ones. The conservation of generic names should receive further consideration, and preparation begun for the proposal of important genera for conservation at the next Botanical Congress. Finally, the author recommends the reconstruction of the Special Committees appointed by Congresses, in order to secure more effective action.

JØRSTAD (I.). **Some Cyprian Uredinales.**—*Nyt Mag. Naturv.*, *1942*, 83, pp. 191–229, 1942. [Received September, 1945.]

Among the 25 rusts recorded from Cyprus in this paper [*R.A.M.*, xviii, p. 90] are *Gymnosporangium fuscum* (commonly referred to *Gymnosporangium sabinae* (Dicks.) Wint., an invalid binomial under the Rules of Botanical Nomenclature, the epithet being prior to 1801) found on *Pyrus syriaca*, and *Uromyces trifolii-repentis* on *Trifolium fragiferum* and *Hippomarathrum crassilobum* (the latter a new host for the rust). The name *U. trifolii* (Hedw. f.) Lév. is inadmissible, as *Puccinia trifolii* Hedw. f. ex DC. was recorded as occurring on *T. repens*, *T. filiformis* (= *T. minus* Sm.) and *T. hybridum*, and evidently embraces both *U. nerviphilus* (syn. *U. flectens*) and *U. trifolii-repentis* (but not the common rust on *T. pratense*, cf. *U. fallens*).

JØRSTAD (I.). **The Ustilagineous genus Tuburcinia in Norway.**—*Nyt Mag. Naturv.*, *1942*, 83, pp. 231–246, 1942. [Received September, 1945.]

Descriptive notes are given on 20 species of *Tubúrcinia* found in Norway, with keys to the species found on each of the different host-families. In an introductory paragraph the author states that in his opinion the proposal by the Plant Pathological Committee and the Nomenclature Committee of the British Mycological

Society to place *Urocystis* on the list of Nomina Generica Conservanda [*R.A.M.*, xviii, p. 755] comes too late, as the renaming has already taken place, and the new names have already been used. Furthermore, many species described by Liro, Ciferri, Sydow, Lavrov, and Cunningham have no *Urocystis* epithet. To preserve *Urocystis* would, therefore, necessitate considerable renaming, and would also be of very doubtful advantage. The proposal should be rejected. If Liro, like Ulbrich, had held that it was justifiable to regard *Tuburcinia* and *Urocystis* as two distinct genera, the former embracing only one species, *T. orobanches* (Mérat) Fr. [ibid., xx, p. 598], no wholesale changing of names would have been necessary. *T. ferruginea*, described by Liro from tulip bulbs and later found in Norway on *Botrytis*-infested shallots and carrots, is now stated to belong to *Papulaspora*.

GUTNER (L. S.). Головневые Грибы. [The smut fungi of the U.S.S.R.]—vi+374 pp., 137 figs., Leningrad, State Publishing Department, Section of Agriculture, 1941. [Received September, 1945.]

This work is based upon the uncompleted manuscript of the late A. A. Jaczewski, written during the years 1916 to 1920 and unpublished at the time of his death. It has been revised and brought up to date by the author, who has retained 140 of the 207 species embracing 10 genera described by Jaczewski, and has added 318 other species belonging to 23 genera, including 5 new species and 5 new combinations. The first part of the book (pp. 7–30) provides general information on the smuts and the latter part (pp. 31–331) deals with their systematic characters and position (including notes on geographical distribution). Some species have been included which, while they are not found in Russia, occur in countries contiguous with or near to the U.S.S.R. Appended to the work are a list of excluded species, a bibliography of over 550 titles, and indexes of hosts and parasites.

FISCHER (G. W.) & HIRSCHHORN (ELISA). **The Ustilaginales or 'smuts' of Washington.**—*Bull. Wash. agric. Exp. Sta.* 459, 84 pp., 52 figs., 1945.

In the introduction to this bulletin the authors state that approximately one-fifth of the smuts reported for the entire North American continent are known to occur in the State of Washington and that 146 species of plants serve as hosts for these 51 species of smuts.

The smuts described are arranged (with keys) in four artificial groups: stem smuts, leaf smuts, inflorescence smuts, and gall-forming smuts. In addition to a description, the synonymy, hosts, and photographs of the infected host and spores are given for each species. Host and parasite indexes and a select bibliography conclude this useful publication.

VIÉGAS (A. P.). **Alguns fungos do Brasil. II. Ascomicetos.** [Some fungi of Brazil. II. Ascomycetes.]—*Bragantia, S. Paulo*, iv, 1–6, pp. 5–392, 220 pl., 34 figs., 1944.

Included in this copiously annotated list of Brazilian Ascomycetes [cf. *R.A.M.*, xxiv, p. 207], besides a number of new genera and species, are *Capnodium musae* n.sp. on leaves of banana; *Taphrina pteridis* n.sp. on fronds of *Pteris*; *Sclerotinia ricini* on *Ricinus communis* described by Godfrey from Florida [ibid., vi, p. 526], *Taphrina deformans* on peach, *Dictyostomiopelta manihoticola* n.g., n.sp., and *Diaporthe manihoticola* Viégas (*Trab. Reun. argent. Agron.* 71, 1941) on cassava, and *Montagnella opuntiarum* Speg. on *Opuntia ficus-indica*. The contribution is fully illustrated and the bibliography comprises 200 titles.

VIÉGAS (A. P.). **Alguns fungos do Brasil. III. Ustilaginales.** [Some fungi of Brazil. III. Ustilaginales.]—*Bragantia, S. Paulo*, iv, 12, pp. 739–751, 10 pl., 4 figs., 1944.

Included in this critically annotated list of Brazilian Ustilaginales are *Sorosporium reilianum* [*Sphacelotheca reiliana*] on maize, *S. sorghi* on sorghum and *Sorghum*

halepense, *Ustilago tritici* on wheat, *U. zeae* [*U. maydis*] on maize and *Euchlaena mexicana*, and *Polysaccopsis hieronymi* on *Solanum* sp. [*R.A.M.*, xxii, p. 454].

ELLISON (B. R.). **Flagellar studies on zoospores of some members of the Myceto-zoa, Plasmodiophorales, and Chytridiales.**—*Mycologia*, xxxvii, 4, pp. 444–459, 4 figs., 1945.

In this paper the author shows that a germinating spore of *Plasmodiophora brassicae* [*R.A.M.*, xxiv, p. 43] was observed with two actively beating flagella, confirming Ledingham's researches [ibid., xviii, p. 449] indicating that the zoospores of *P. brassicae* are biflagellate. With reference to the tendency of some authors to refer the members of the Plasmodiophorales to the Woroninaceae [ibid., xxiv, p. 74], the author points out the presence of two forms of flagella in some species, one a tinsel and the other a whip-lash type, and considers that this must be held to exclude *P. brassicae*, the type-genus and species of the family Plasmodiophoraceae, and the order Plasmodiophorales from relationship to the Woroninaceae on the ground of its type of flagellation.

UNAMUNO (L. M.). **Notes micológicas.** [Mycological notes.]—*An. Jard. bot. Madr.*, iv, pp. 145–166, 6 figs., 1944.

The following are among the 72 species of Spanish fungi (of which four are new) comprised in this critically annotated list [cf. *R.A.M.*, xx, p. 495, xxiv, p. 387]: *Septoria chrysanthemi-indici* on *Chrysanthemum maximum* [ibid., vii, p. 245]; *S. dianthi* on *Dianthus armeria*, a new record for the country; *Septogloeum carthusianum* on *Euonymus europaeus*; and *Alternaria hortensiae* n.sp., producing on the leaves of *Hydrangea hortensis* numerous circular lesions, 2 to 8 mm. in diameter, brownish-red on the lower and dark purple on the upper surface, with whitish centres, and characterized by brown, straight or slightly curved, bi- to triseptate conidiophores, united in fascicles of two or three, 40 to 72 by 7·5 to 8 μ, and brown, oblong to subclavate conidia, 48 to 70 by 15 to 17 μ, provided with 5 to 9 transverse septa and generally one longitudinal, oblique septum, and with a hyaline or subhyaline beak, 70 to 135 μ in length, having up to four septa.

JORDÁN DE URRÍES Y AZARA (M.). **Hongos microscópicos del Valle de Benasque (Pirineos aragoneses).** [Microscopic fungi of the Valley of Benasque (Aragonese Pyrenees).]—*An. Jard. bot. Madr.*, iv, pp. 167–193, 7 figs., 1944.

Included in this critically annotated list of 63 Pyrenean fungi are *Puccinia allii* on *Allium carinatum*, *P. buxi* on box (*Buxus sempervirens*), *Valsa ambiens* on *Corylus avellana*, and *V. leucostoma* on birch [*R.A.M.*, xxii, p. 42].

LOSA ESPAÑA (D. M.). **Aportaciones a la flora micológica gallega.** [Contributions to the Galician mycological flora.]—*An. Jard. bot. Madr.*, iv, pp. 195–240, 23 figs., 1944.

Among the fungi (about 100) listed with critical annotations in this further contribution to the knowledge of Galician fungi [*R.A.M.*, xiii, p. 596], may be mentioned *Cylindrosporium cameliae* Gonz. Frag. on *Camellia* sp., *Cicinnobolus crepidis* n.sp. on *Crepis virens* leaves attacked by *Oidium erysiphoides*, *Puccinia antirrhini* on *Antirrhinum majus* (the first record for Spain [but see ibid., xxii, p. 53]), and *P. fusca* on *Anemone nemorosa*.

RAYSS (T.). **Contribution à l'étude des Deuteromycètes de Palestine.** [Material for the study of the Deuteromycetes of Palestine.]—*Palest. J. Bot.*, J. Ser., iii, 1, pp. 22–51, 1 pl., 4 figs., 1943. [Received August, 1945.]

Continuing his studies of the mycoflora of Palestine [*R.A.M.*, xxii, p. 497], the author supplies a list of 150 species, of which the following may be mentioned:

Phyllosticta fusiformis f. *microcarpa* n.f. [ibid., vii, p. 652], on loquat leaves, characterized by pycnidia smaller than the typical species with walls only 25 μ thick and spores often containing droplets; *Cicinnobolus cesatii* [ibid., xxii, p. 264] and *C. taraxaci* on *Oidium* spp.; *Cytospora* [*Valsa*] *ambiens* [ibid., xxii, p. 42] strongly attacking poplar (*Populus nigra*); *Darluca filum* parasitizing *Puccinia antirrhini* so powerfully that it may be a means of controlling the rust; *Ascochyta pisi* on peas; *A.* [*Didymella*] *lycopersici* on frost-damaged potato leaves; *A. trifolii* on *Trifolium alexandrinum*; *Septoria divaricata*, with which *S. drummondi* [ibid., xx, p. 469] is considered by Grove [ibid., xv, p. 53] to be identical, on phlox; *S. iridis* found on leaves on *Iris haynei* but not on those of adjacent varieties; *S. lycopersici* on tomato; *S. petroselini* on parsley; *S. rubi* on leaves of *Rubus sanctus*, a new host; *Colletotrichum circinans* on shallots, a new record for Palestine; *Cercospora armoraciae* on horse-radish; *Cercospora judaica* n. sp. on vine leaves, producing scattered, round, amphigenous spots, 4 to 10 mm. in diameter, with dark margins, and characterized by densely fasciculate, straight or somewhat bent, dark olive, septate conidiophores, 27 to 45 by 4 to 6 μ, and straight or curved, pale olive, uni- to quadriseptate conidia, 32 to 50 by 6 to 8 μ; *C. personata* on groundnut; *Helminthosporium teres* on barley; *H. turcicum* on maize; *Tuberculina persicina* on various rusts [ibid., xxii, p. 264]; and *Isariopsis griseola* on bean leaves.

ZWIRN (H. E.). **Studies on Leveillula taurica (Lév.) Arn.**—*Palest. J. Bot.*, J. Ser. iii, 1, pp. 52–53, 1943. [Received August, 1945.]

The author states that *Leveillula* [*Oidiopsis*] *taurica* is widely distributed in Palestine on tomatoes, eggplants, artichokes, and various wild plants [*R.A.M.*, xv, p. 683; xviii, p. 83]. It has also been found by Dr. Bremer on potato in Turkey.

In inoculations carried out with conidia from various hosts the fungus failed to pass from one genus to another, whereas the controls were readily infected provided the temperature was not too low or the atmospheric humidity too high. Biometrical measurements of conidia from different hosts showed marked variations, especially as regards the coefficient length/width, those borne on leaves floated on sugar solution being much larger than the normal ones, although the length/width ratio remained constant. The coefficient proved similarly stable in conidia from the same host species taken from the north and south of the country.

O. taurica is markedly xerophytic. Conidia germinate best at 26° C. on a dry slide with a relative humidity between 52 and 75 per cent. Infection does not take place through the stomata, as Blumer thought [ibid., ii, p. 181], but by means of an infection hypha derived from an appressorium. The influence of the parasite on the host consists mainly of a disturbance in the water relations, diseased leaves having a higher transpiration and a lower water content than healthy ones. Thus they shrivel and drop.

CLAYTON (E. C.) & GAINES (J. G.). **Temperature in relation to development and control of blue mold (Peronospora tabacina) of Tobacco.**—*J. agric. Res.*, lxxi, 4, pp. 170–182, 4 figs., 1945.

The inhibitory effects of moderately high temperatures on blue mould of tobacco (*Peronospora tabacina*) observed in Georgia led the authors [*R.A.M.*, xxiv, p. 251] to investigate the possibility of controlling the disease through temperature regulation. Attempts made to determine the optimum temperature for spore germination showed great variations, some collections germinating best at temperatures between 35° and 50° F. and others between 64° and 79°; a single optimum temperature for germination does not exist. As no germination took place at or above 85° or at 32° or below, the optimum temperatures embraced a range little less than the total range over which germination occurred. Leaf infection was

favoured by temperatures of 64° to 75° F. The spores are produced in the early morning and die in a few hours unless infection occurs, maximum sporulation occurring at a night temperature of 60° F. preceded by a higher day temperature. Viability of the spores was affected by the temperature at the time of formation and at germination. Minimum night temperatures of 70° F. and above almost inhibited sporulation in tobacco plant beds and their maintenance provided an effective control of mould disease, but plants grown in reduced light, as a result of shading or greenhouse-grown plants in midwinter conditions, sporulated freely at minimum temperatures as high as 80° F., and under such conditions temperature control is impracticable. The lethal effect of temperatures over 85° on the fungus was not modified by the conditions of the host, and blue mould in plants constantly exposed to reinfection was controlled by exposure to 110° for 4 hours per week. Complete control in greenhouse plants, using heat from the sun, was achieved at temperatures of 105° to 110°. Heat treatment, however, generally costs more than spray or gas treatment, and is not likely to be widely adopted.

COSTA (A. S.). **Moléstias de virus do Fumo no Estado de S. Paulo.** [Tobacco virus diseases in the State of S. Paulo.]—*Bragantia, S. Paulo*, iv, 12, pp. 709–738, 26 figs., 1944.

A well-illustrated account is given of the symptoms and etiology of the following virus diseases of tobacco in São Paulo, with directions for their control: 'vira-cabeça' (tomato spotted wilt virus) [*R.A.M.*, xxi, p. 354], white necrosis or 'cabbage tobacco' (probably due to the streak virus of J. Johnson [ibid., xix, p. 497]), veinbanding [potato virus Y: ibid., xx, p. 606], tobacco and cucumber mosaics and (?) tobacco leaf curl [ibid., xix, p. 305].

GERSTEL (D. U.). **Inheritance in Nicotiana tabacum. XX. The addition of Nicotiana glutinosa chromosomes to Tobacco.**—*J. Hered.*, xxxvi, 7, pp. 197–206, 3 figs., 1945.

This paper describes the addition of chromosomes from *Nicotiana glutinosa* to tobacco by the utilization of artificial polyploidy and a series of back crosses and selfings [*R.A.M.*, xxiii, p. 152]. One of the characters of *N. glutinosa* thus incorporated in tobacco was resistance to tobacco mosaic disease. The additional races proved meiotically rather stable and bred fairly truly.

BRYANT (L. R.) & KREUTZER (W. A.). **Wet soil promotes Tomato rot.**—*Food Packer*, xxvi, 8, pp. 59–60, 1 fig., 1945.

In 1943 a trial of three cultural practices, viz. ridging, mulching, and staking, designed to prevent tomato rot (*Phytophthora capsici*) by the elimination of excessive moisture, an essential condition for its development, was set up at the Colorado Agricultural Experiment Station [*R.A.M.*, xxiv, p. 124]. These methods were compared with the ordinary custom of growing the plants on flat ground and allowing them to sprawl unhindered. The average percentages of healthy fruits in the ridged, mulched, staked, and control plots, which were heavily inoculated and irrigated at the onset of ripening, were, 80·78, 89·42, 98·05, and 60·53, respectively. In 1943 seven fungicides were tested on Landreth tomatoes grown under the most favourable conditions for the development of *P. capsici* with the following results (in average percentages of sound fruits): 5 per cent. yellow cuprocide plus 95 per cent. Cherokee clay, 82·10; same proportions of yellow cuprocide and talc, 83·6; 10 per cent. yellow cuprocide plus 90 per cent. talc, 77·82; 10 per cent. basicop plus 90 per cent. talc, 72·69; 10 per cent. tribasic copper sulphate plus 90 per cent. talc, 71·93; 10 per cent. copper oxychloride plus 90 per cent. talc, 82·37; Bordeaux mixture 4–4–50, 83·17; and control, 65·43. It will be seen from these data that

the yellow cuprocide and copper oxychloride dusts approximate in efficacy to Bordeaux mixture, and the former are much easier to apply.

In 1944 preliminary tests were carried out with a new procedure, involving the running of the irrigation water over 5 lb. copper sulphate for each 135 ft. of row immediately after inoculation of the soil. Although the prevailing temperatures were too low to permit of extensive spread of the pathogen, the results were sufficiently promising to justify further tests of the treatment.

ABERDEEN (J. E. C.). **Diseases of the Tomato and their control.**—*Qd agric. J.*, lx, 5, pp. 277–299, 10 pl., 1945.

A key is given to aid in identifying tomato diseases in the seed-bed and field, followed by a description and recommendations for control of Irish blight (*Phytophthora infestans*), target spot (*Alternaria solani*), leaf spot (*Septoria lycopersici*), bacterial spot (*Bacterium vesicatorium*) [*Xanthomonas vesicatoria*: *R.A.M.*, xx, p. 152], *Fusarium* wilt (*F. bulbigenum* var. *lycopersici*), *Verticillium* wilt (*V. albo-atrum*), bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), bacterial canker (*Aplanobacter* [*Corynebacterium*] *michiganense*), virus diseases, namely, mosaic, spotted wilt, big bud [ibid., xx, p. 182], streak, and fern leaf [ibid., xvii, p. 354], and blossom-end rot.

COSTA (A. S.). **Observações sôbre vira-cabeça em Tomateiros.** [Observations on 'vira-cabeça' in Tomatoes.]—*Bragantia, S. Paulo*, iv, 8, pp. 489–507, 8 figs., 1944.

Much of the information presented in this study on tomato 'vira-cabeça' [a strain of the tomato spotted wilt virus] in São Paulo, Brazil [*R.A.M.*, xxiii, p. 365], has already been noticed from other sources, but the following points may be of interest. In one out of two varietal reaction experiments Market King contracted the lowest percentage of infection (3·6) and a type of Rei Humberto the highest (39·7), while in the other the minimum of 3·8 developed on Rutgers and the maximum of 14 on Seleto. Among other well-known commercial varieties included in both tests, Earliana, Lucullus, Bonny Best, Marglobe, and Stone showed 12·3, 13·8, 18·5, 25·5, and 26·4 per cent. spotted wilt, respectively, in the first, and 13·8, 12·6, 11·4, 7·8, and 12, respectively, in the second. *Lycopersicon pimpinellifolium*, *L. hirsutum*, and certain strains of *L. peruvianum* have shown resistance to spotted wilt in São Paulo, and the same is true of hybrids between the first-named and Early Jewel, the fruits of which, however, approximate to those of the wild parent and are thus without commercial interest.

'Vira-cabeça' is undoubtedly the most serious disease of tomatoes in some localities, e.g., at the Citricultural and Central Experiment Stations, Campinas, where entire crops may be involved, while a private grower in the same district was compelled in 1939 to abandon a planting too heavily infected to be worth the expense of picking.

Roguing for the control of 'vira-cabeça' should be carried out immediately the first symptoms appear; at a later stage it is of little use. In experiments on tobacco the extermination of the insect vector (*Frankliniella* sp.) in the seed-bed failed almost completely to reduce the incidence of the disease in the field, and presumably the same consideration would apply to tomatoes. An important measure of control may be achieved by the choice of suitable localities for tomato plantings, avoiding the humid conditions favouring an abundance of thrips. Another very effective means of combating 'vira-cabeça' in tobacco (and here again tomatoes would probably respond similarly) consists in transplanting at the beginning and end of the rainy periods, i.e., September to October and February to March, when the plants are likely to develop most satisfactorily.

KLECZKOWSKI (A.). **Conversion of non-precipitating and inhibiting protein complexes into forms again precipitable by the antisera to the original proteins.**—*Brit. J. exp. Path.*, xxvi, pp. 33–41, 1945.

Experiments carried out by the author demonstrated that when the tomato bushy-stunt virus [cf. *R.A.M.*, xxiv, p. 292] was heated together with a serum albumin, the virus was able to combine with the albumin to form a complex which did not precipitate with the antiserum to the virus. The virus, which is resistant to peptic proteolysis, was recovered in the precipitable form by peptic hydrolysis of the complex.

CLAUSON-KAAS (N.), PLATTNER (P. A.), & GÄUMANN (E.). **Über ein welkeerzeugendes Stoffwechselprodukt von Fusarium lycopersici Sacc.** [On a wilt-producing metabolic product of *Fusarium lycopersici* Sacc.]—*Ber. schweiz. bot. Ges.*, liv, pp. 524–527, 1944.

Two distinct types of wilting developed in the detached pinnate leaves of six- to eight-week-old tomato plants, with petioles 8 to 10 cm. long, placed in filtrates of cultures of *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xiv, p. 310] on Richards's solution. (1) The petiole retained its erect habit and normal diameter, though becoming rather dry. The leaves showed black spots and assumed a brittle texture, curling upwards at the margins. These symptoms were characteristic of leaves immersed in a 0·1 per cent. solution of the filtrate adjusted to P_H 7 with a dilute sodium lye containing a trace of ferric chloride. (2) The petiole drooped, becoming soft and flaccid; the portion projecting from the solution eventually shrivelled into a fine thread. The leaves rolled sharply inwards, became very limp, and turned blackish-green to black; it was some time before they shrivelled and crumbled. This form of wilting was observed on leaves in the pure filtrates. Besides these two well-defined syndromes, various transitional types of the disease occurred on the inoculated material.

A leaf immersed in 7 c.c. water containing 2 mg. culture filtrate + 0·04 mg. ferric chloride (P_H 7) wilted in 36 to 60 hours, whereas in the absence of the iron activator the process took 100 to 150 hours. When leaves from five tomato plants that had been kept in a dark room for 15 hours were placed in a 0·03 per cent. filtrate solution with an admixture of ferric chloride, no wilting developed in 50 hours, whereas leaves taken from the identical plants after three hours in daylight and transferred to the filtrate, also in daylight, wilted completely during the same period. On removal to daylight, the leaves kept in the dark wilted in 40 hours. Loss of turgidity in the treated foliage would thus appear to be associated with active transpiration and a correspondingly heavy intake of water [cf. ibid., xi, p. 86].

IRVING (G. W.), FONTAINE (T. D.), & DOOLITTLE (S. P.). **Lycopersicin, a fungistatic agent from the Tomato plant.**—*Science*, N.S., cii, 2636, pp. 9–11, 1 fig., 1 graph, 1945.

From the expressed juice of Pan America tomato plants the authors obtained an antibiotic agent 'lycopersicin' which, though still impure, shows marked fungistatic activity towards *Fusarium bulbigenum* var. *lycopersici*. It occurs throughout the mature plant, and in the crude preparations available withstands autoclaving for at least 15 minutes at 15 lb. pressure. It is dialysable, adsorbed from aqueous solution at P_H 5·5 on charcoal, soluble in water and methanol, partially soluble in ethanol, and insoluble in chloroform, acetone, ethyl acetate, ether, petroleum ether, and benzene.

A rapid and accurate method for the assay of the fungistatic activity of lycopersicin, based on the cylinder-plate method, was devised. Growth of the fungus was uniformly raised, white, and cottony, developing evenly and spontaneously over the whole agar surface. Inhibition zones surrounding the cylinders were

sharply defined and susceptible of accurate measurement. The control cylinders, filled with water, showed no inhibition.

Preliminary assays of the different parts of a number of tomato varieties for lycopersicin activity at all stages of growth indicated that (*a*) all the varieties tested, including Bonny Best (highly susceptible to wilt), Rutgers and Marglobe (resistant), and Pan America and Red Currant (highly resistant) contain the inhibitor; (*b*) lycopersicin activity, absent from the seed, appears in seedlings germinated in the dark and in the plant within eight days after planting; (*c*) the concentration of lycopersicin varies to some extent with the age of the plant and considerably with the plant part assayed.

Ogilvie (L.). **Seed infection as a cause of outbreaks of Didymella stem-rot of Tomato.**—*Gdnrs' Chron.*, Ser. 3, cxviii, 3060, pp. 71–72, 2 figs., 1945.

A new and alarming feature of the tomato stem and fruit rot (*Didymella lycopersici*), prevalent in recent years in the west of England, is the occurrence of stem rot in glasshouses. After reviewing the researches of Orth, Sheard, and Small [*R.A.M.*, xviii, p. 636; xxii, pp. 378, 466], the author states that C. J. Hickman found that seven out of ten samples of seeds from the Evesham district were infected in 1942. In experiments at Long Ashton infected seed grown in sterilized soil gave rise to seedlings infected with *D. lycopersici*, 8·5 per cent. in one test and about 5 per cent. in another. The tips of the cotyledons were shrivelled and appeared to have been infected directly from the seeds, which were carried up above the soil. Later the badly diseased ones died off, while infected cotyledons on otherwise healthy plants dropped and the plants recovered.

In a further test seed disinfection with organo-mercury dusts eliminated infection in the seedlings, but later over 80 per cent. of the plants showed stem rot. It is concluded that infected seed can give rise to infected seedlings, some of which die off and infect the soil, leading to stem rot among older plants at soil-level. The gravity of this is only apparent when it is realized that stem-rot infection under such condition often becomes epiphytotic, particularly in glasshouses, without symptoms being present on seedlings. Attributing this mainly to the use of contaminated seed culled from field-grown diseased fruit, the author considers the employment of carefully selected seed from healthy plants grown under glass a sound measure of control both for indoor and outdoor crops.

Taylor (G. G.). **Bordeaux mixture, copper oxychloride, and copper oxide sprays for control of late-blight (Phytophthora infestans) of Tomatoes.**—*N. Z. J. Sci. Tech.*, A, xxvii, 1, pp. 9–13, 1 fig., 1945.

The serious (frequently total) losses from late blight (*Phytophthora infestans*) experienced by Auckland tomato-growers were reduced to less than 1 per cent. by regular applications (seven or eight) of 3–4–50 Bordeaux mixture at heavy volumes (up to 516 gals. per acre) in experiments from 1940 to 1944 on the Kondine Red and Adelaide Dwarf varieties. Copper oxychloride (cuprox) at 5 lb. in 100 gals. is comparable to Bordeaux in its fungicidal action, and being free from the deleterious effects on plant growth exerted by the latter, it results in larger yields. Copper oxide (perenox) occupied a position similar to cuprox in the one year in which it was used. Further work is necessary to determine the optimum spray dosages and spray volumes per acre applicable to commercial conditions.

Joffily (J.). **Ferrugem do Eucalipto.** [Eucalyptus rust.]—Bragantia, S. Paulo, iv, 8, pp. 475–487, 4 pl. (1 col.), 1944. [English summary.]

Nursery plants of *Eucalyptus citriodora* in the municipality of Itaguai, Rio de Janeiro, Brazil, were observed in January, 1943, to bear the very inconspicuous uredospores of a rust, which was identified a month later, when teleutospores had

developed on 20 specimens transferred to the laboratory of the Campinas Agronomic Institute, as a *Puccinia* and specifically assigned by G. B. Cummins and F. D. Kern to *P. psidii* [*R.A.M.*, xxiv, p. 353]. The *Uredo* stage of the rust was first reported on *Eucalyptus* from Brazil in a preliminary list of the fungi of Espírito Santo by Gonçalves da Silva in 1939 [ibid., xx, p. 36], and in conversation with B. Pickel the writer learnt that it had also been found on the same host in Pernambuco. *P. psidii* is widely distributed in several parts of the country on Myrtaceae, but this appears to be the first record of its occurrence on *Eucalyptus*. Infection by the rust involves the foliage, petioles, and new stem tissues and renders the seedlings unfit for transplanting. Of 13 species of *Puccinia* recorded on Myrtaceae, only one, *P. rompelli*, appears from a perusal of the relevant literature and the examination of herbarium material to differ appreciably from *P. psidii*.

TINT (H.). **Studies in the Fusarium damping-off of conifers. I. The comparative virulence of certain Fusaria. II. Relation of age of host, pH, and some nutritional factors to the pathogenicity of Fusarium.**—*Phytopathology*, xxxv, 6, pp. 421–457, 3 figs., 10 graphs, 1945.

At the University of Pennsylvania, Philadelphia, four standard fungi, namely, *Sclerotium bataticola* [*Macrophomina phaseoli*], *Rhizoctonia* [*Corticium*] *solani*, *Pythium ultimum*, and *Penicillium* sp., and monospore cultures of 25 *Fusarium* lines were tested for pathogenicity on seedlings of eight conifers, viz., *Pinus resinosa*, *P. sylvestris*, *P. nigra* var. *austriaca*, *P. ponderosa*, *P. banksiana*, *Abies concolor*, *Picea pungens*, and *Pseudotsuga taxifolia* from different parts of the United States [*R.A.M.*, x, p. 569; xx, p. 612; *et passim*]. In tests on *Pinus resinosa* seedlings in quartz sand approximately half of the *Fusarium* spp. reduced emergence significantly compared with the controls, and all but one caused heavy post-emergence losses, the significance of the exception being questionable. *M. phaseoli* did not lower emergence but caused high post-emergence losses; *C. solani* effected severe losses in both categories; and *Pythium ultimum* and *Penicillium* sp. did not significantly reduce emergence or cause post-emergence losses. Of the various methods tried inoculations in sterilized soil cultures yielded the most statistically accurate results. Using this procedure, a number of *Fusarium* lines equalled and occasionally exceeded in virulence *P. ultimum* and *C. solani*, causing reduced emergence and increased post-emergence losses. *M. phaseoli* caused the lowest emergence losses, but post-emergence attack was relatively high. *Pinus resinosa* and *Pseudotsuga taxifolia* were the most susceptible of the hosts both to pre- and post-emergence infection, while *Pinus ponderosa* sustained the least damage from the former phase of the disease and *Picea pungens* was the most resistant to the latter.

Although nursery losses should ordinarily be less extensive than those induced experimentally, conditions of comparable severity might arise in certain circumstances, in which event normally saprophytic or moderately parasitic species of *Fusarium* could well be responsible for reductions in emergence on the scale found in these tests.

In *Pinus resinosa* seedlings grown in quartz sand culture and inoculated with two lines of *F. avenaceum*, *F. vasinfectum*, *F. oxysporum*, *F. aquaeductum* var. *medium*, *F. sporotrichioides*, and the four above-mentioned standard fungi, the losses due to the more virulent species appeared relatively early and reached their maximum levels within some three weeks of emergence, whereas those induced by less pathogenic lines were delayed, though generally culminating within 30 days. In the case of *M. phaseoli*, the losses were low for the first six weeks, after which they rose to a level round 90 per cent. before 75 days. Resistance to invasion by *F. oxysporum* increased directly with age in 1- to 55-day-old seedlings of *P. resinosa*.

In autoclaved and unsterilized soil samples, emergence reductions of *P. resinosa*,

P. ponderosa, and *P. sylvestris* due to inoculation with *F. oxysporum* and *F. avenaceum* were usually low to moderate at P_H values in the acid range [cf. ibid., xviii, p. 358] and high above P_H 8. Post-emergence damping-off was low in the more acid samples, reached a maximum on the acid side of neutrality, declined sharply in the sterilized soil at P_H 7·5 and in the unsterilized at P_H 8·1, and attained a uniformly high level in the most alkaline substrata. In quartz sand cultures of varying P_H, losses among *P. nigra* var. *austriaca*, *P. resinosa*, and *P. sylvestris* seedlings inoculated with the same two fungi were generally high at all acidity levels, though damping-off tended to become more prevalent with increasing alkalinity.

In quartz sand culture tests on the effects of variations in the concentration of certain components of the nutrient solution [ibid., ii, p. 82], a deficiency of nitrogen produced relatively negligible losses in *P. resinosa*, whereas excess caused early and severe infection by *F. oxysporum* and *F. avenaceum*. Calcium and phosphorus deficiencies resulted in heavy losses from damping-off, which were considerably reduced by an excess of these elements. Deficiencies of potassium, sulphur, and magnesium produced rather larger stands than the corresponding excesses, the latter series resembling controls grown and inoculated in standard solutions.

KIMMEY (J. W.). **The seasonal development and the defoliating effect of Cronartium ribicola on naturally infected Ribes roezli and R. nevadense.**—*Phytopathology*, xxxv, 6, pp. 406–416, 2 graphs, 1945.

The observations herein described and tabulated on the development and defoliating action of white pine blister rust (*Cronartium ribicola*) on *Ribes roezli* and *R. nevadense*, the principal associates of sugar pine [*Pinus lambertiana*], in their native habitat in the northern Sierra Nevada, California, were made in 1938, 1941, and 1943. In general, the susceptibility of the two species to infection and the capacity of *R. nevadense* for teleutospore production agreed with reports of earlier studies in British Columbia and the Pacific Northwest [*R.A.M.*, xii, p. 407; xvii, p. 639; xxiii, p. 122]. *R. roezli* remained the more susceptible, its infected leaf area producing a higher percentage of teleutosorus-bearing surface and nearly twice the amount of teleutosorus columns per unit of such surface, but the premature shedding of its diseased leaves still rendered it less of a menace to pines than *R. nevadense* per unit of population. In unworked areas of the sugar pine region, on the other hand, the larger population of *R. roezli* (2,900 ft. living branchwood per acre compared with 420 for *R. nevadense*) more than counterbalances its limited capacity for the retention of teleutosorus-bearing leaves, and here it is likely to prove a richer source of inoculum than *R. nevadense*.

Factors contributing to the premature shedding of infected leaves of *R. roezli* include severity of infection, relatively dry sites, youth and vigour of the foliage, exposure to direct sunlight, and early autumn frosts, of which only the first and last appreciably affected the process in *R. nevadense*. Infected *R. roezli* plants growing under shade and forming a profusion of new woody growth, especially on moist sites, are the most potentially dangerous in respect of the spread of blister rust, since the apical leaves of the current season's growth on such plants were the last to drop in the autumn and consequently bore uredospores and viable teleutosori for a maximum period.

The success or failure of *C. ribicola* to infect pines in any given year depends largely on the duration of rainfall before *Ribes* defoliation. Under infection and weather conditions comparable to those in the areas under observation in any of the three test years, *R. roezli* should bear sufficient inoculum for an attack on pine from late July to late September (or mid-October in the case of the shade forms), the corresponding period for *R. nevadense* extending from early August to late October.

MARTÍNEZ (J. B.). **Un 'Fusarium' patógeno, nuevo paro la micoflora española.** [A pathogenic *Fusarium* new to the Spanish mycoflora.]—*An. Jard. bot. Madr.*, iv, pp. 61–73, 2 pl., 1944.

Fusarium oxysporum var. *aurantiacum*, a new record for Spain, is reported as the agent of damping-off of *Pinus pinea* in Alicante and *P. halepensis* in Valencia, both new hosts for science. Directions are given for the control of the disease by means of soil and seed disinfection, singly or combined, on the lines practised in the United States, Germany, and the U.S.S.R.

RENNERFELT (E.). **Der Zuwachs einiger Torulopsidacéen in Nährböden und Flüssigkeiten verschiedenen osmotischen Wertes.** [The growth of certain Torulopsidaceae in media and liquids of varying osmotic value.]—*Acta Hort. Gotoburg., 1940–1*, xiv, pp. 87–97, 2 figs., 3 graphs, 1940. [Received August, 1945.]

Certain members of the Torulopsidaceae isolated from mechanical wood pulp at the Gothenburg (Sweden) Botanical Institute [*R.A.M.*, xxi, p. 58], viz., *Geotrichum candidum*, *Mycotoruloides* sp., *Rhodotorula glutinis*, *R. gracilis*, *Torulopsis candida*, and *T. molischiana*, were grown on synthetic solid and liquid media adjusted to varying osmotic pressures by the addition of cane sugar. None of the organisms was able to develop on agar at a sugar concentration exceeding 60 per cent. (93·6 per cent. relative vapour tension), but in liquid media scanty growth was made at 80 (88 per cent.). The stronger the osmotic pressure of the substratum or the lower its relative vapour tension, the longer is the period required by the fungi for germination and the smaller are the colonies produced. These occupants of wood pulp were found to belong to the hygrophile group of fungi.

GRAM (E.). **Klornitrobenzol-Forbindelser som Middel mod Kaalbrok, Kartoffelskurv, Kløver-Baegersvamp og 'Brune Rødder' paa Tomat.** [Chlornitrobenzene compounds as remedies against Cabbage club root, Potato scab, Clover rot, and 'brown roots' of Tomato.]—*Tidsskr. Planteavl*, xlix, pp. 119–143, 5 figs., 1 graph, 1944. [English summary.]

A tabulated survey is given of experiments in plant disease control in Denmark with a number of chlornitrobenzene preparations of I.G.Farben. Promising results were obtained in the control of turnip club root (*Plasmodiophora brassicae*) in 1935 by soil treatment with a mixture of brassicol (20 per cent. pentachlor-nitrobenzene +80 per cent. filler) [*R.A.M.*, xx, p. 33] and calcium nitrate at dosages of 500 and 525 kg. per ha., respectively, which increased the yield (in hectokg. per ha.) of sound or slightly infected roots from 10·8 for calcium nitrate alone and 21 for calcium cyanamide to 102·9. In 1941 the weight per white cabbage plant in plots treated with brassisan [loc. cit.; ibid., xxi, p. 177] at 30, 40, and 60 gm. per sq. m. amounted to 463, 530, and 730 gm., respectively, the corresponding figures for Bayer 2326 (a chlornitrobenzene compound of undisclosed composition) at the same rates being 700, 825, and 650 gm., respectively, and for the controls 317. The lowest incidence of club root (2·8 in a scale ranging from 0 to 5) occurred in the Bayer 2326 (30 gm.) plots.

In the case of potato scab (*Actinomyces scabies*), Bayer P (100 per cent. pentachlornitrobenzene) was the most effective of the fungicides tested, the percentages of almost or entirely scab-free tubers in the plots receiving 0, 60, and 120 kg. P per ha. in 1940 being 25, 61, and 69, respectively, and its action persisted the following year. In another trial in 1940 on a site already treated in 1939, the tuber and dry matter yields (in hectokg. per ha.) in the control plots and in those given 60 and 120 kg. P per ha. were 358, 379, and 384 and 84·6, 89·5, and 91·8, respectively. The scab index figures (0 to 3 scale) were 1·7, 1·3, and 1·1, the percentages

of almost or entirely scab-free tubers 48, 59, and 69, respectively, and the percentages of those bearing *Rhizoctonia* [*Corticium*] *solani* sclerotia 34, 17, and 15, respectively. In 1941 the scab index figure in the P plot receiving 60 kg. P in 1940 (nothing in 1939) was 1·4 as against 2·3 in the control and the percentage of almost or entirely scab-free tubers 57 compared with 20. The corresponding figures for the plot given 60 kg. P in 1939 (nothing in 1940) were 1·9 and 39, respectively. In a test in 1939 the joint application of P at 60 or 120 kg. per ha. and ammonium sulphate (500 kg.) gave very satisfactory results, the percentages of completely sound tubers in the plots receiving the two dosages being 45 and 54, respectively, compared with 27 in the control, and the scab index figures 0·9 and 0·8, respectively, as against 1·5.

Dusting with P and brassicol, with or without talc (1:4), effectively combated clover rot (*Sclerotinia trifoliorum*). For instance, in a test in 1939–40, the number of dead plants in plot of 3 by 3 m. dusted four times with brassicol-talc (100 kg. per ha.) was 2·2 compared with 13·2 in the control plot and 1 in that treated with brassicol (20 kg.). Using a portable rotation duster, one man can cover 1 ha. seed-clover in three hours.

Brown root rot is a glasshouse tomato disorder of obscure etiology [ibid., xviii, p. 715], characterized in the early stages by a zonate, brown discoloration of the fibrous roots which finally involves the entire system and paves the way for decay by facultative fungal and bacterial parasites. The premature destruction of the roots cuts off the water supply to the aerial organs, resulting in poor development, wilting, and a reduction of yield to half or a third of the normal. Some degree of control was achieved by the application of P or brassicol to the soil just before planting.

SAMUEL (G.) & GARRETT (S. D.). **The infected root-hair count for estimating the activity of Plasmodiophora brassicae (Woron.) in the soil.**—*Ann. appl. Biol.*, xxxii, 2, pp. 96–101, 4 pl., 1945.

The authors present in this paper a method for estimating the relative numbers of *Plasmodiophora brassicae* spores germinating in different soils by counting infected root hairs, in the hope that it may yield results unobtainable by the growing of plants in pots or in the field, and valuable for the investigation of particular problems concerning club-root disease. Cabbage seedlings are grown for a week at 25° C. in glass tumblers of the infected soils; after washing out, the tap-roots are stained in 1 per cent. aceto-carmine and a count is made of the number of root hairs containing zoosporangia of *P. brassicae* along 2 cm. of root. The main factor inhibiting infection was found to be soil alkalinity, however produced. It was observed that in soils receiving N/10 sodium and potassium chlorides in place of distilled water the number of infected roots was reduced. Root-hair infection was also inhibited by low soil moisture content.

WALKER (J. C.) & HOOKER (W. J.). **Plant nutrition in relation to disease development.**—*Amer. J. Bot.*, xxxii, 6, pp. 314–320, 2 figs., 1945.

Young cabbage plants of (1) a strain highly susceptible to yellows (*Fusarium oxysporum* f. *conglutinans*) [*R.A.M.*, xxiii, p. 371], (2) an intermediate resistant strain, and (3) a highly resistant strain, growing in quartz sand cultures irrigated with nutrient solutions varying in salt concentration and in balance of nitrogen, phosphorus, and potassium were studied with a view to establishing the rate and severity of development of the disease. Except at low concentrations of inoculum, increase of salt concentration promoted a progressive decline in the rate of disease development, although slower at 19° C. than at 25°. While the disease development curves had the same relation to each other at 25° as at 19°, they were closer together after 20 days at the higher temperature. In the case of intermediate

resistant plants, inherent host resistance completely controlled the disease at 19° and no effect of salt concentration could be measured; while at 25° the curves for four out of five nutrient concentrations followed closely those for the susceptible strain at 19°.

Omission of potassium from the solution increased the rate of disease in the susceptible strain at 19° and 25°, but when nitrogen and phosphorus were omitted disease development decreased at 19° and 25° in the susceptible strain and at 25° in the intermediate resistant. The highly resistant strain showed no sign of disease whatever concentrations of salt or balance of nitrogen, phosphorus, or potassium were used in the nutrient. No correlation could be determined between the rate of growth of the host and the decline or increase of yellows infection brought about by changes in salt concentration or mineral balance.

GRAM (E.). **Virus-gulsot hos Beder. Beta Virus 4.** [Virus yellows of Beets. *Beta* virus 4.]—*Tidsskr. Planteavl*, xlvii, pp. 338–362, 1942. [English summary.]

Virus yellows of beets [sugar beet yellows: *R.A.M.*, xix, p. 386] has probably been in existence in Denmark at least since 1914. The disease chiefly affects the fodder varieties, those grown for sugar sustaining less damage. Sweet [? Swiss] chard (*Beta cicla viridis*) [? *B. vulgaris* var. *cicla*], red garden beets, and spinach are occasionally attacked. During the years 1932 to 1934, inclusive, infection occurred early and covered wide areas, and in such cases losses may be considerable, involving a fall of up to 3 per cent. in the sugar content and a 25 per cent. reduction in yield; in most seasons, however, the development of the virus is only sporadic.

Foliar yellowing is not a very reliable diagnostic feature, since it may arise from several causes and be more or less suppressed by shade, high precipitation, and the liberal use of nitrogenous manures. A brittle texture of the leaves is a valuable field symptom where the alternative possibility of magnesium deficiency can be excluded. Sachs's iodine starch test usually evokes a positive reaction before the appearance of the yellow discoloration, and shortly prior to, or coincidentally with, the development of brittleness in the foliage. Sugar beets sown in late autumn for seed production in the following year commonly escape infection, but fresh outbreaks of yellows may be caused by the visits of aphids to sprouting beets in open pits in the spring. The incubation period of the virus is about three weeks. Control measures [cf. ibid., xxiv, p. 397] should include the timely sorting of healthy mother-beets (before the onset of the normal autumn colouring), late sowing and early clearing of autumn spinach, and the location of first-year crops at a distance from seed beets or spinach exceeding the 500 m. prescribed as reasonably safe in the case of mosaic.

MILTHORPE (F. L.). **The compatibility of protectant seed dusts with root nodule bacteria.**—*J. Aust. Inst. agric. Sci.*, xi, 2, pp. 89–92, 1 fig., 1945.

Tests in which pea seed was simultaneously inoculated with *Rhizobium leguminosarum* [*R.A.M.*, xxi, p. 511] and treated with ceresan, cuprox, spergon, and chloranil showed that spergon alone allowed satisfactory nodulation, and even in this case the seed had to be sown within two hours of inoculation. Chloranil came next in order of successful nodulation, followed by cuprox, and then by ceresan. The last-named prevented all nodulation unless the seed was sown immediately after inoculation. It would seem that the ability of the nodule bacteria to diffuse away from the zone of toxic concentration of a protectant dust exercises an important effect on nodulation. The moisture content of the soil at sowing time would appear therefore to influence the degree of nodulation.

Wilt-resistant canning Pea named for Prof. E. J. Delwiche.—*Canner*, ci, 15, p. 11, 1945.

The first and only variety of canning pea bred for resistance to both common pea wilt [*Fusarium orthoceras* var. *pisi*: *R.A.M.*, xxii, p. 87] and near-wilt [*F. oxysporum* f. 8; ibid., xviii, p. 777] has been produced at the University of Wisconsin and is named Delwiche Commando. A sweet, mid-season variety with wrinkled seed, it has proved almost completely resistant to both diseases locally. Near-wilt has already been identified in specimens from Maryland, Delaware, New Hampshire, Massachusetts, Idaho, and Montana.

Cass Smith (W. P.). **The Bean mosaic menace.**—*J. Dep. Agric. W. Aust.*, xxii, 1, pp. 20–25, 3 figs., 1945.

A vegetable disease survey undertaken in April and May, 1944, disclosed widespread damage to bean crops attributed to the bean mosaic virus, involving a failure of 20 to 50 per cent. in an area including Wanneroo, Balcatta, Osborne Park, and Spearwood. The insidious progress of the disease is such that most growers were unaware of it as the agent of their losses and, in view of its being seed-borne and liable to dissemination by aphids, steps are being taken to produce disease-free seed from the healthiest crops of good type under Government supervision, and to familiarize growers with the symptoms of the disease and the measures required for its control.

The recent rapid spread of bean mosaic virus is explained by the scarcity of sound seed during the war. In these circumstances, growers have had to raise their own seed with a consequent fall in quality, the ill effect of which has been increased by failure to rogue out diseased plants and, in view of the high prices, by reserving for seed production the inferior 'tail-end' part of the crop—a practice which cannot be too strongly condemned, for the amount of infected seed may be seriously increased when only the late-maturing portion of the crop is saved. The recent considerable rise in the price of pole bean seed should simplify the production of disease-free seed under Government supervision.

Meanwhile, growers are recommended to raise their own stocks only from the best available seed, on plots isolated to prevent the spread of infection caused by aphid invasions from neighbouring affected bean crops; and as aphids thrive best in the cooler spring months, the planting of the seed crop should be delayed until early summer. Roguing-out should begin as soon as the first trifoliate leaves appear and be repeated once a week for the first month, and thereafter at fortnightly intervals throughout the growing season. To facilitate roguing of 'white-seeded runner' or other pole bean varieties the plants should be trained up single poles set vertically in the ground and spaced a little wider in the rows than usual. Any plants affected with halo blight [*Pseudomonas medicaginis* var. *phaseolicola*] or other diseases should be removed when roguing. Finally, on the crop reaching maturity, seed should be selected from good-type, heavy-yielding plants and, in the case of the 'white-seeded runner' variety, off-type plants bearing flat instead of round pods should be discarded.

Weber (Anna). **Mosaiksyge i Skalotter.** [Mosaic disease among Shallots.]—Reprinted from *Gartnertidende, 1943*, 29, 2 pp., 1 fig., 1943. [Received August, 1945.]

Mosaic (*Allium* virus 1) [yellow dwarf] is reported to be so prevalent among shallots [*R.A.M.*, xxiv, p. 133] in Denmark that in some districts inspectors have been unable to find a single market-garden without some diseased plants. Steps have been taken in Jutland to procure healthy sets from gardens with a high proportion of sound plants, but the disease can only be controlled by the adoption

of similar measures on a wider scale. Under present conditions the crop is assuming greater importance than in former years, when yellow dwarf was largely overlooked, firstly because its infectious nature was not recognized, and secondly on account of the abundant supplies of healthy and relatively cheap onions available from southern countries.

WHITE (N. H.). **Fungal soft rot of Carrots.**—*Tasm. J. Agric.*, xvi, 2, pp. 59–60, 1945.

Towards the end of May, 1944, carrots growing in the Smithton swamps of Tasmania rotted from the tips and the lowermost parts of the roots. The outside of the affected areas was depressed and frequently blackened, and the soft, water-soaked tissue underneath showed the presence of *Phytophthora megasperma* [*R.A.M.*, xiv, p. 211]. Inoculations of healthy, unwounded and wounded carrots with cultures from diseased material gave negative results. Dowson had obtained a similar result in 1931 [loc. cit.] and concluded that abnormally wet conditions were primarily responsible for predisposing the carrots to attack by the fungus. Rainfall records showed that both 1931 and 1944 were years of heavy May rainfall.

Fresh, healthy, mature carrots were then immersed in tap water for three days, when symptoms of 'drowning' set in, i.e., the cortical tissue became flaccid and there were indications of alcoholic breakdown. One lot of 'drowned' carrots was inoculated by placing the fungus on the surface or in a wound, and the remainder were left uninoculated, carrots that had not been 'drowned' being similarly treated, and all the lots kept in a moist atmosphere. After ten days at room temperature the 'drowned' inoculated carrots alone developed infection.

It is concluded that 'drowning' resulting from waterlogging in late autumn predisposed the plants to attack. Carrots grown in swampy soils should be dug and marketed as soon as mature, in early April, and adequate drainage should be provided.

RADER (W. E.). **Ansatospora acerina found causing decay of stored Carrots in Wayne County, New York.**—*Plant Dis. Reptr*, xxix, 20, p. 522, 1945. [Mimeographed.]

Ansatospora acerina [*R.A.M.*, xxiv, p. 305] was isolated from carrots collected during the winter and spring of 1945 from 20 storage plants in five counties of New York State in the course of an investigation conducted to ascertain the cause of an outbreak of decay in carrots which occurred in six storage houses in Wayne County, where decay of celery induced by *A. acerina* is highly prevalent. The fungus causes black lesions, indistinguishable from those produced by *Alternaria radicina*, on either the crown or the sides of the carrots. In cross section the rot produced by *Ansatospora acerina* is black except for the advancing margin, which is brown and usually presents a saturated appearance, in contrast to the discrete, black margins of the lesions formed by *Alternaria radicina*.

TYNER (L. E.). **Fusarium sambucinum Fkl. F. 6 Wr. as a pathogen of some species of the Cucurbitaceae.**—*Sci. Agric.*, xxv, 9, pp. 537–541, 1945.

During August, 1942, *Fusarium sambucinum* f. 6 was isolated from the stems of vegetable marrow plants at Brooks, Alberta, which had developed a severe wilt, accompanied by an extensive buff-coloured dry rot of the crown.

When cucumber seeds, both untreated and treated with 1 per cent. by weight of 2 per cent. ceresan dust were planted in pots in the greenhouse in five different samples of local soil inoculated with the fungus, the average percentage emergence of the treated and untreated seed was, respectively, 16·4 and 5·4, 8 and 8·4, 17·4 and 20·4, 38 and 6·4, and 18 and 18, as against 94 per cent. germination for the same seed in a moist chamber.

Cucumber, pumpkin, squash, and marrow seed both untreated and ceresan-dusted were planted in pots of inoculated soil in the greenhouse. Fifteen days later, the treated seed showed 40, 9, 70, and 10 per cent. living plants respectively, and the untreated 17·5, 0, 30, and 0. When cucumber, muskmelon, marrow, and pumpkin seeds were planted in pots of soil inoculated with cultures of the fungus from lucerne, potato, and marrow, only the marrow strain showed pathogenicity, which was very marked. The fungus showed increasing virulence to cucumber and pumpkin at temperatures ranging from 15° to 25° C.

In another experiment pumpkin, squash, and marrow seeds were planted on 19th May in 12 ft. rows in the field (25 seeds per row) and 150 gm. soil-grown inoculum added; by 5th July there were 76, 34, and 43 living plants, respectively, in the control rows and only 2, 8, and 0, respectively, in the inoculated. When the inoculum was placed in contact with the seed, only a few plants escaped destruction even in the seedling stage. Growth of the mycelium through the soil was demonstrated. This appears to be the first record of a physiologic form of this fungus being a major pathogen to cucurbits.

WALKER (M. N.). **Galls on the roots of Citron-Watermelon hybrids.**—*Phytopathology*, xxxv, 6, pp. 480–482, 1 fig., 1945.

In 1933 and 1935 the roots of many plants of F_1 hybrids from watermelon-citron crosses obtained from the Iowa Agricultural Experiment Station and grown at Leesburg, Florida, were found on pulling to bear pedicellate, glistening white, later darkening galls, which on expansion tended to become tuberculate and divided, finally developing into dense, cauliflower-like structures entirely different from those associated with nematodes (*Heterodera marioni*) or *Bacterium tumefaciens*. Root proliferation round the galls was another feature of some of the excrescences. An inoculation experiment with the bacteria filling the intercellular pockets throughout the superficial layers of the galls gave inconclusive results, and no opportunity has yet arisen for further studies on the disorder.

YU (T. F.), CHIU (W. F.), CHENG (N. T.), & WU (T. T.). **Studies on Pythium aphanidermatum (Edson) Fitz in China.**—*Lingnan Sci. J.*, xxi, 1–4, pp. 45–62, 2 pl., 1 graph, 1945.

Since 1932 a destructive fruit rot of the white gourd (*Benincasa hispida*), prevalent in Kiangsu Province, has been under investigation at the Nanking College of Agriculture and at Chengtu in western China. The causal organism, *Pythium aphanidermatum*, besides attacking fruits and vegetables in the field, during storage, or in the market, is also responsible for damping-off of seedlings and decay of the vegetative organs. In the course of the studies herein described, the fungus was isolated from the following plants in addition to *B. hispida* [cf. *R.A.M.*, xiv, p. 7]: watermelon, melon, cucumber, vegetable marrow, squash, *Lagenaria leucantha*, *Luffa acutangula*, *L. cylindrica*, *Momordica charantia*, cotton (*Gossypium hirsutum* and *G. indicum*), chilli, tobacco, eggplant, sweet potato, bean, beet, Chinese cabbage, *Pachyrrhizus tuberosus*, *Ipomoea reptans*, *Amaranthus tricolor*, and *Aleurites fordii*, of which the four last-named are new hosts. The results of cross-inoculation experiments did not reveal any consistent differences in pathogenicity among the various isolates.

The development of *P. aphanidermatum* is promoted by a high relative humidity (90 per cent. and upwards) and retarded at or below 85 per cent. The optimum air temperature for the fungus lies between 30° and 35° C. Satisfactory growth was made on most standard media, the minimum, optimum, and maximum temperatures for mycelial expansion being 5° to 10°, 29° to 31°, and upwards of 41°, and the optimum for sporangial germination 24° to 26°. The optimum P_H

reaction for the growth of the pathogen is about 6·1, development ceasing at 2·5 and 10·7 on the acid and alkaline sides of neutrality, respectively.

P. aphanidermatum was isolated from various types of soil, including flower, vegetable, and fruit beds and forest ground (small conifers); in heavily infested field soil it was found at a depth of at least 8 in. below the surface in abundance varying in proportion to the amount of moisture present. Infection of field plants takes place exclusively through the soil, in which the fungus can persist for at least four years in a viable condition. Thus, cucumber seeds sown in soils one, two, three, and four years after infestation gave rise to seedlings with an average (in four replications) of 70·8, 17·9, 3·5, and 0·7 per cent. damping-off, respectively. Control measures, apart from the avoidance of continuous cropping, have not yet been worked out.

WILSON (C.). **A Diplodia associated with concealed damage in Peanuts.**—*Phytopathology*, xxxv, 6, p. 480, 1945.

'Concealed damage' is the term applied to an internal deterioration of Alabama groundnut seed characterized in the early stages by a small, dirty white to pale yellow spot on the inner face of the cotyledon which spreads until the whole embryo is blackened and pervaded by hyphae, while the cotyledons become rancid and are frequently intersected by a dense mycelial mat. Only the final stages of disorganization are apparent in unbroken seeds. The results of an examination in 1944 of over 1,200 seeds from samples collected in twelve widely separated fields in the south-east of the State do not support B. B. Higgins's conclusion that soil-inhabiting species of *Rhizoctonia*, *Penicillium*, and *Rhizopus* and *Sclerotium bataticola* [*Macrophomina phaseoli*] are responsible for the condition. The predominant organism obtained, irrespective of the method of sterilization or the medium used, was a *Diplodia*, tentatively identified as *D.* [*Botryodiplodia*] *theobromae*, which developed from 65 per cent. of all the seeds plated and constituted roughly 95 per cent. of the total number of isolates, *M. phaseoli*, *Fusarium*, *Aspergillus*, *Penicillium*, and *Rhizopus* spp. and bacteria accounting for the rest. The frequency of isolation of the *Diplodia* strongly suggests its etiological implication in the disease.

VIÉGAS (A. P.). **Alguns fungos da Mandioca. I. II.** [Some Cassava fungi. I. II.]—*Bragantia, S. Paulo*, iii, 1, pp. 1–19; 2, pp. 21–29, 6 pl., 5 figs., 1943. [Received September, 1945.]

The cassava mildew occurring in Minas Gerais, Brazil, was referred by Müller to *Oidium manihotis* Áverna-Saccá [*R.A.M.*, xiv, p. 87], while Gonçalves da Silva assigns the species on the same host in Espírito Santo [ibid., xx, p. 36] to *O. manihotis* P. Henn. The author could not obtain the original diagnosis of either species, nor did he have access to Hennings's type material for comparison with the mildew on cassava in São Paulo, which can therefore only be provisionally identified with *O. manihotis* P. Henn. The conidia of the author's collections are larger (28 to 40 by 12 to 20 μ) than given by Saccardo in *Syll. Fung.* for *D. manihotis* P. Henn. The disease is without economic importance.

The collar rot caused by *Sclerotium rolfsii* may be responsible for heavy losses under the optimum conditions for the pathogen prevailing from December to February. Other hosts of the fungus in São Paulo include potato, *Boehmeria nivea*, bean, groundnut, *Crotalaria juncea*, Texas cotton, lucerne, carrot, strawberry, maize, rye, and the weeds *Oxalis* sp. and *Solidago microglossa*.

Phyllosticta manihotae n. sp., the agent of amphigenous, zonate, indistinctly marginate, often confluent lesions, ashen-grey on the under and brown to fuscous on the upper side, on living cassava leaves, is characterized by globose, subcuticular, fuscous pycnidia, aggregated or solitary, concentrically arranged, 100 to 170 μ

in diameter, shining ostioles, 15 to 20 μ in diameter, hyaline conidiophores, 1·5 to 2 μ in diameter, and hyaline, smooth, elliptic-ovoid conidia, 5 to 8 by 2 to 3 μ.

VIÉGAS (A. P.). **Pleophragmia manihoticola n. sp.**—*Bragantia*, iii, 3, pp. 45–48, 1 fig., 1943. [Received September, 1945.]

Pleophragmia manihoticola n. sp., isolated from lesions on cassava leaves at Campinas, São Paulo, Brazil, differing somewhat from those caused by *Cercospora henningsii* in the same State [*R.A.M.*, xx, p. 445], is characterized by sparse, obclavulate, short-stipitate, thick-walled, blunt-tipped asci, 100 to 180 by 40 μ, containing eight irregularly disposed, oblong-elliptical, fuscous, smooth, muriform ascospores, with a hyaline outer wall, divided by five transverse septa and one longitudinal septum, 20 to 24 by 7 to 9 μ. Paraphyses were not observed.

ARNAUD (G.). **Développement des maladies de la Vigne dans la région parisienne (mildion, Oidium, anthracnose).** [The development of Vine diseases in the region of Paris (mildew, *Oidium*, anthracnose)].—*Ann. Epiphyt.*, N.S., vi, 1, pp. 37–66, 7 graphs, 1940. [Received September, 1945.]

Observations carried out in the vicinity of Paris over a period of years on the annual development of vine mildew (*Plasmopara viticola*), *Oidium* (*Uncinula necator*), and anthracnose (*Elsinoe vitis*) [*E. ampelina*: *R.A.M.*, xxii, p. 419] and on vine resistance to early frosts in autumn led to the following conclusions. Locally, mildew generally develops later than in the south of France, occurring most frequently in the middle of summer, generally during the period when the minimum temperatures are often over 10° C. Amount of rainfall having only an uncertain relationship with the conditions of humidity that favour infection, rainfall measurements should be replaced by measurements of atmospheric humidity for practical purposes. Experimental evidence showed that five spray applications made at dates shown by annual statistics to be most suitable should usually suffice if supplemented by further treatments applied during the periods of active growth of the vine, and by two applications of copper dust to protect the bunches. These treatments are, however, effective only if carried out with care.

In 1938 and 1939, *U. necator* was exceptionally severe at Versailles. At first it was confined to certain branches which were completely infected, though the surrounding ones remained healthy, but towards midsummer it became generalized and completely destroyed the fruit clusters. On the Carignane variety it caused three-quarters of the leaves to fall prematurely. Spraying with Bordeaux mixture afforded marked protection to the leaves, but appeared to have no effect at all on the fruit, possibly owing to lack of adhesiveness.

Anthracnose has persisted for five or six years at Versailles on the hybrid Seibel 5813 growing under shade, though this and other varieties have remained unaffected in sunny situations.

ARNAUD (G.). **La Vigne et l'électricité atmosphérique.** [The Vine and atmospheric electricity.]—*Ann. Epiphyt.*, N.S., vii, 1, pp. 55–63, 2 pl., 2 diags., 1 graph, 1941. [Received September, 1945.]

During July, 1940, the author examined vines growing in the vicinity of Bordeaux which had been affected by electrical discharges from the atmosphere during stormy conditions without rain in the preceding month [cf. *R.A.M.*, xiii, p. 423; xviii, p. 152]. Most of the damage occurred on the principal branch of the year, and consisted of a superficial browning of the parts between the internodes, the tissue of the nodes in most cases remaining unaffected. Within the branch, the discoloration usually affected the medulla, where an empty space was sometimes left, following contraction of the tissues against the inner surface of the wood. The young lateral shoots generally remained healthy at first, though sometimes

they showed a browning of the medulla at their base; in some instances these shoots wilted, as water was unable to ascend into the lower, and most affected, parts. In general, it may be said that the effect became clearly defined as soon as the action causing it had taken place, only badly affected organs took several weeks to succumb, while those less severely affected became temporarily arrested and later resumed growth.

ANNAND (P. N.). **Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1944.**—56 pp., 1945.

In this report it is stated that phony peach disease [cf. *R.A.M.*, xvii, p. 125; xxi, p. 378] has apparently been eradicated from six entire States, and reduced by 98 per cent. in eight others, since 1936. Continued progress in control has permitted the lifting of quarantine regulations in 18 additional counties in five States; no spread to new counties was detected. It has also been possible to remove a county in Utah from the peach mosaic-regulated area [ibid., xxii, p. 381]; the number of nurseries ineligible for certification has decreased annually, and no spread of the disease from nursery stock shipments has been recorded for six years.

No trace of citrus canker [*Xanthomonas citri*] can now be found in Texas, and Federal participation in inspection has been withdrawn. Federal financing of eradication of Dutch elm disease [*Ceratostomella ulmi*: ibid., xxiv, p. 211] has also been discontinued, States and property-owners being now responsible for removing infected trees. Emphasis is now transferred from eradication of known sources of infection to the control by quarantine of spread.

Progress in the campaign against white pine blister rust [*Cronartium ribicola*: ibid., xxii, pp. 118, 119] is reviewed (p. 40), and notes are also given (pp. 44–46) on barberry eradication in relation to wheat stem rust [*Puccinia graminis*] control.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1939–1940.** [Observations and researches carried out at the State Phytopathological Station during the year 1939–1940.]—*Bull. Inst. agron. Gembloux*, ix, 1–4, pp. 1–15, 3 figs., 1940; x, 1–4, pp. 5–10, 1941. [Flemish, German, and English summaries.]

In the first of these two reports [cf. *R.A.M.*, xix, p. 133] it is stated that during 1939 *Phytophthora erythroseptica* was recorded on potatoes in Belgium for the first time. Young flax was attacked by *Verticillium dahliae*, generally during May and June; the disease affected the external tissues of the roots and the root hairs, impeding water absorption and mineral nutrition, thus causing the plants to wilt and die. The condition has probably been present for many years, but has hitherto escaped detection. Asparagus growing near Keerbergen was attacked by *Fusarium culmorum* [ibid., xviii, p. 431], also a new record for Belgium. Soil disinfection being impracticable economically, the cultivation of this crop should be abandoned for the time being in badly affected areas. The disease was most prevalent in old plantings and in those where the general treatment of the plants, particularly manuring, was not carried out satisfactorily. Apricot mosaic (peach mosaic virus) [cf. ibid., xx, p. 370] was recorded for the first time in Belgium.

In the second report (p. 7) it is stated that flax was again attacked by *V. dahliae* in 1940.

Annual Report of the Science Service, Dominion Department of Agriculture, for the year ended March 31st, 1944.—72 pp., 1944.

Owing to war conditions it has not been found possible to publish annual reports of the Science Service of the Dominion Department of Agriculture, Canada, since 1938, when a general reorganization of the Department led to its establishment

of the Science Service as a separate unit. The Plant Protection Division was added to it in 1942 [*R.A.M.*, xxii, p. 9]. This is, therefore, the first annual report published by the Science Service, and several of its many points of interest are noted below.

Although rejections on account of bacterial ring rot [*Corynebacterium sepedonicum*] in potatoes have declined, the Departments of Agriculture of Alberta, Manitoba, New Brunswick, and Ontario now undertake surveys on their commercial growing areas; and more thorough and energetic methods for eradicating the disease are being demanded. The disease has not been found in Nova Scotia, apart from one case in 1939, which was completely stamped out. A single case was reported and dealt with by the authorities in British Columbia during 1943–4. No bacterial ring rot was observed on Prince Edward Island in 1943, only one record was made in 1942 and two in 1941; infected crops were sold to a starch factory and the storages, machinery, and tools were disinfected.

Turnip seed-producers in the Maritime Provinces have agreed to supply Ontario growers with treated seed, which has successfully controlled infection by *Xanthomonas campestris*, an increasingly serious pathogen in Ontario during recent years. The three Maritime Pathological Laboratories are treating all foundation, élite, and approved swede seed planted in the Maritimes for seed production with hot water, followed by an approved dust treatment prior to distribution. All registered swede seed for sale to the trade will have approved treatment in the cleaning plants before packaging. Experiments show that swede seed treated with ceresan or thiosan suffers no loss of germinating power, and should safely overwinter in 1 lb. packets in storage ready for sale and sowing in the spring. Other kinds of treated seed remain to be tested for unimpaired survival in winter storage.

A medium compounded by S. S. Ivanoff for *Bacterium tumefaciens* and used successfully as a selective medium for *Pseudomonas medicaginis* var. *phaseolicola* by R. D. Wilson [ibid., xvii, p. 577], is suggested for planting out seeds suspected of being infected by this pathogen.

Magnesium deficiency in potatoes, hitherto insignificant, caused great loss on Prince Edward Island in 1943 and found the farmers quite unprepared for its control. Factors favouring the disorder were high soil acidity (P_H 4·5 to 5·2), heavy acid-forming non-magnesium dressings, low organic matter in the soil, and leaching and erosion of magnesium under prolonged rainfall. Timely and adequate spraying with magnesium sulphate corrected the deficiency and averted heavy crop losses.

Investigations conducted at Fredericton, New Brunswick, have shown that potatoes may suffer severely as a result of the toxic effect of aphid feeding alone, but reaction to this injury varies widely. Susceptible varieties stimulate the production of winged forms which leave the plants as injury progresses, a factor of importance in the dissemination of virus diseases.

Severe losses of carrots in Nova Scotia and continued loss in British Columbia, both due to *Alternaria radicina* [ibid., xxii, p. 340] were reported during 1942–3, seed treatment in both cases offering an encouraging method of control.

St. Catharine's Laboratory, Quebec, has experimented successfully in three orchards with powdered cyanamide as a floor treatment designed to prevent apothecial sporulation of the peach brown rot fungus [*Sclerotinia fructicola*]. Early spring cultivation is considered, however, to control this danger equally effectively. In the same orchards, wind-blown spores from adjacent peaches, plums, and cherries caused rot at harvest where there was virtual immunity from rot at blossoming.

The Ontario maize-breeding studies [ibid., xxiv, p. 363] demonstrated the superiority of the puncture method of inoculation in producing consistently satisfactory indexes of infection in stalks and ears. *Diplodia zeae* showed greater

virulence than any of the other pathogens in stalk infection, and host susceptibility was found to increase with the advance of maturity. *Fusarum moniliforme* [*Gibberella fujikuroi*] caused almost as much damage as *D. zeae*.

Nineteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1944–1945.—65 pp., 1945.

In this report [cf. *R.A.M.*, xxiii, p. 473] it is stated that four applications of Bordeaux mixture (3–4–50) reduced bacterial wilt of beans [*Pseudomonas medicaginis*] from 76 to 2·7 per cent., cuprox (5 per cent.) giving comparable results. Resistance trials with 137 lines comprising approximately 70 varieties showed that all white-seeded varieties are highly resistant to wilt (and to anthracnose [*Colletotrichum lindemuthianum*]), that all runner varieties are seldom seriously infected on the pods, though their foliage may be moderately affected, and that a number of varieties with coloured seed are strongly resistant, particularly Hawkesbury, Canadian Wonder, Pinto, Pink, Tennessee Greenpod, Ne Plus Ultra, and many strains of Refugee.

A further outbreak of citrus canker [*Xanthomonas citri*: ibid., xxiii, p. 294] in Tauranga necessitated the destruction of diseased trees in an area where eradication had not previously been enforced. As three years have elapsed since the last outbreak in Kerikeri, it is evident that the eradication of infected orchards gives adequate control.

In a rapid survey in North and Mid-Canterbury, wheat eye spot [*Cercosporella herpotrichoides*: ibid., xxii, p. 351] was found only at Lincoln on a few plants in a small experimental plot at the Wheat Research Institute farm.

Raspberry rust (*Phragmidium rubi-idaei*) [ibid., xx, p. 596] became widespread at Palmerston North, and was also found in commercial areas in Wellington Province; severe defoliation sometimes followed leaf infection. Tomato streak caused heavy losses in Hutt Valley, Wanganui, and Cheviot; inoculations with the pure virus showed the disease to be identical with *Lycopersicum* virus 1 of Smith, 1937 [a strain of tobacco mosaic virus]. Preliminary investigations into the cause of yellow leaf of *Phormium tenax* have begun; a brief survey of the Moutoa area, in the Manawatu, showed that incidence there ranges from a trace to 85 per cent. Some varieties appear to be more susceptible than others, but none is immune.

Commercial methods were devised for treating soils with chloropicrin [ibid., xxiv, pp. 78, 172], which controls damping-off and *Verticillium* wilt. A new product, D.D. (a mixture of dichloropropane and dichloropropylene) gave comparable results, while being cheaper and less objectionable to use.

In five years of growth, twelve new peach varieties showed almost complete immunity from leaf curl [*Taphrina deformans*]. In the Roxburgh area, peaches showing mottle leaf with defoliation and loss of vigour, and sprayed with manganese sulphate and hydrated lime in 1943–4 and again in 1944–5, now present healthy foliage and normal vigour [cf. ibid., xxii, p. 252].

Several tobacco gardens showed the presence of angular leaf spot [*Pseudomonas angulata*: ibid., xxiv, p. 475]. An examination of five lots of 200 plants in the tobacco gardens of 21 growers in Dovedale, Motueka, and Riwaka revealed a great reduction in initial mosaic as compared with the previous season, the average percentage being only 8·7, as against 37·1 in 1943–4. In a test designed to demonstrate the ease with which mosaic can be spread by workers handling tobacco plants [cf. ibid., xvii, p. 560; xix, p. 371], the controls (clean hands) showed 5 per cent. infection, plants pulled with infected hands 36 per cent. infection, those laid out with infected hands 67·5 per cent., and those pulled after thorough washing of hands, 1·5 per cent.

Annual Report of the Agricultural Experiment Station, Rio Piedras, Puerto Rico, 1942–43.—59 pp., 1944.

The following subjects of phytopathological interest are noted from this report [*R.A.M.*, xxi, p. 408]. A strain of *Fusarium moniliforme* [*Gibberella fujikuroi*] seriously attacked field maize at the Isabela Substation. Seed of a new cucumber produced by the Agricultural Experiment Station for resistance to downy mildew [*Pseudoperonospora cubensis*] has been distributed to many growers, and progress towards the production of mosaic-resistant varieties of pepper [*Capsicum*], pumpkin, and tomato is reported.

Tobacco virus 1 [tobacco mosaic virus] and the 'mirasol' pepper virus, described by Roque and Adsuar [ibid., xxi, p. 401] were found responsible for two types of tomato mosaic. Tomatoes grown on the Station grounds were seriously affected by the 'mirasol' virus, mechanical transmission of which was found to be difficult from tomato to tomato, but easy from tobacco to tomato. The virus entity became inactivated in dead plant tissues of diseased tomato and tobacco plants. During the summer of 1942, it was practically impossible to grow tomatoes in the Rio Piedras region on account of this disease.

Report of the Federal Experiment Station in Puerto Rico, 1944.—44 pp., 1945.

In the section of this report dealing with seed treatment (pp. 28–29), D. L. STODDARD, after pointing out that seed rots and pre-emergence damping-off are important diseases of the Seminole variety of soy-beans in Puerto Rico, states that valuable protection against these conditions was afforded by seed treatments with arasan, semesan, and spergon, which gave increases of 10 to 100 per cent. in the stands.

Both semesan and cuprocide caused damage to *Cinchona* seed and reduced the stand of seedlings by 90 per cent. or more, but liquid applications of both made after germination were not injurious and controlled the spread of damping-off.

D. L. STODDARD and J. R. PÉREZ (pp. 34–35) adduce evidence showing that the incidence of root rot of vanilla [*R.A.M.*, xix, p. 201] is greatly reduced and the vegetative and reproductive growth of the plant improved where calcium is available to the plant.

FLINT (L. H.) & MORELAND (C. F.). **Note on gall formation in decapitated young Bean plants.**—*Plant Physiol.*, xx, 3, pp. 453–456, 1 fig., 1945.

Greenhouse tests on decapitated young bean plants indicated that gall formation is not essentially correlated with the action of extraneous agents, such as growth substances or crown gall bacteria (*Phytomonas* [*Bacterium*] *tumefaciens*): these results are interpreted as evidence that under some conditions the action of natural wound hormones might modify or obscure the extent or nature of gall development considered as a plant response to an applied growth substance.

BROWN (J. G.) & BOYLE (ALICE M.). **Application of penicillin to crown gall.**—*Phytopathology*, xxxv, 7, pp. 521–524, 1 fig., 1 diag., 1945.

The writers' successful experiments in the control of crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) on *Bryophyllum* by the application of crude penicillin from *Penicillium notatum* have already been noticed from another source [*R.A.M.*, xxiv, p. 406].

MINZ (G.). **Cereal diseases in Palestine.**—48 pp., 24 figs., Agricultural Research Station, Rehovot, 1945. [Hebrew.]

An account is given of the chief diseases of wheat, barley, oats, maize, sorghum, and rye found in Palestine, together with notes on their control by seed treatment.

LING (L.). **Aecial hosts of Puccinia graminis in China.**—*Phytopathology*, xxxv, 6, pp. 417–420, 1 fig., 1945.

Thirteen Berberidaceae have been shown by herbarium examination and field observations in western Szechuan to harbour the aecidial stage of *Puccinia graminis*, viz., *Berberis acuminata*, *B. henryana*, *B. julianae*, *B. levis*, *B. pruinosa*, *B. sargentiana*, *B. silva-taroucana*, *B. virgetorum*, *B. wilsonae*, and *Mahonia* [*B.*] *fortunei*. Of these, *B. silva-taroucana*, *B. virgetorum*, and *B. fortunei* are recorded for the first time as carriers of the rust, while *B. gagnepainii*, *B. julianae*, and *B. sargentiana*, classified as immune or highly resistant in the United States [*R.A.M.*, xi, p. 628; xvii, p. 21], were heavily infected in China. Another species, *B. dielsiana*, listed as immune from *P. g. tritici* in inoculation tests in Minnesota, usually sustains heavy damage from the rust in the mountains of northern Honan, where it is widely distributed. These observations probably point to the existence in China of virulent physiologic races of *P. g. tritici*, and the introduction into that country of reputedly immune or resistant barberries should not be effected without stringent safeguards.

PETURSON (B.), NEWTON (MARGARET), & WHITESIDE (A. G. O.). **The effect of leaf rust on the yield and quality of Wheat.**—*Canad. J. Res.*, Sect. C, xxiii, 4, pp. 105–114, 1945.

In continuation of earlier experiments at Winnipeg on the effect of *Puccinia triticina* on the yield and quality of wheat [*R.A.M.*, xix, p. 204], field tests were conducted in 1940 with the resistant varieties Thatcher, Renown, Regent, and Apex, in 1941 with Thatcher and Renown, and in 1943 with all four. Half the plots of each variety were kept as free from infection as possible by dusting with kolodust, while the remainder were inoculated with a mixture of some 30 different physiologic races of the rust.

The results showed that heavy infection materially reduced the yield of seed in all four varieties. Light infection depressed the yield of seed, but proportionately less than did heavy infection. Reductions in bushel and kernel weights were substantial from heavy infection and measurable from even moderately light infection. The disease generally caused slight reductions in the number of kernels per head. Analysis of variance results showed that, with the exception of the difference in bushel weights of Regent in 1940 and the differences of yield and bushel weight of Renown in 1941, the reductions in yield, in bushel weight, and in kernel weight were statistically significant. None of the differences in number of kernels per head between comparable rusted and control plants were, however, significant. Leaf rust increased the percentage of protein of the seed in 1940, and decreased it in the other years. The results of milling and baking tests showed that both in 1940 and 1943, infection slightly reduced the flour yield of all four varieties, and increased the yellow pigment content of the flour. The milling and baking quality of the grain was not, however, adversely affected in any other respect, the flour milled from the rusted samples (except Renown in 1940) being even slightly superior in baking strength to that from the non-rusted samples.

In the greenhouse experiments in 1940 and 1941, Thatcher wheat in pots was inoculated with race 76 of the rust at the seven-leaf stage, the heading stage, and the flowering stage, one group being left uninoculated as controls.

It was found that infection significantly reduced the number of kernels per head, the kernel weight, and the yield of seed in all the infected groups in both experiments. Straw weight, except in the group infected at flowering in 1940, was also significantly reduced. The greatest reductions in yield and in number of kernels occurred in the plants infected in the seven-leaf stage, and the lowest in those infected in the flowering stage. The plants infected at the seven-leaf stage produced plumper and heavier kernels than those inoculated at flowering, but many

fewer kernels per plant. The tillers in the groups infected at the seven-leaf and heading stages in 1940, and those in all three infected groups in 1941 were significantly reduced by the rust, mortality in the plants infected earliest being particularly heavy.

Leaf rust significantly reduced the height of the plants infected at the seven-leaf stage in both tests. Most of the loss of yield in the plants infected at the seven-leaf stage was due to reduction in the number of kernels, only a small proportion of it being due to a reduction in kernel weight. On the other hand, in plants infected at flowering, loss in yield was mainly due to reduction in kernel weight, and only secondarily to reduction in the number of kernels. Infection generally increased the protein content of the leaves, and to a less extent of the seed straw.

BREMER (H.). **Bunt of Wheat in Turkey.**—*Zir. Derg.*, iv, 44–45, pp. 124–130, 1943. [Turkish, with English summary. Received September, 1945.]

Effective control of wheat bunt [*Tilletia caries* and *T. foetida*] would raise production in Turkey [*R.A.M.*, xix, p. 464] by 15 to 20 per cent., and recommendations for the accomplishment of this object by standard methods of seed treatment are given. However, the development of resistant wheats from indigenous varieties, some of which show promising resistance, would render such measures superfluous.

JOHNSON (F.). **The effect of chemical soil treatments on the development of Wheat mosaic.**—*Ohio J. Sci.*, xlv, 4, pp. 125–126, 1945.

Calcium cyanide (granulated) at 1, 3, and 5 gm., carbon disulphide at 2, 5, and 10 c.c., chloropicrin, ethyl chloride, ethylene dichloride, and methyl bromide at 0·3, 1, and 3 c.c., commonly used as insecticides and nematocides, were tested by the author as agencies for controlling wheat mosaic [*R.A.M.*, xxiv, p. 407] by adding them to screened soil at a temperature of 16° C., placed in air-tight metal containers and then transferred after sealing to a greenhouse, where the temperature was approximately 27°. The infested treated soil was removed from the metal containers, in which the chemicals had been placed half-way between the bottom and the surface of the soil, aerated, transferred to No. 10 tin cans perforated to allow of drainage, and sown with Purdue No. 1 wheat, a variety highly susceptible to mosaic. After sowing, the cans were placed out of doors over winter in soil trenches 8 in. deep.

Three examinations were made up to the time that the wheat had entered the boot stage and calcium cyanide was shown to give complete control at 5 gm., but none at 1 gm.; carbon disulphide at each concentration tested gave complete control, and chloropicrin and methyl bromide likewise. Ethyl chloride was ineffective and ethylene dichloride gave only incomplete control at the higher concentrations. In another experiment, fumes of naphthalene and rotenone dust, when mixed with the soil, gave complete control of wheat mosaic. It is thought that the chemicals acted on the vector rather than on the virus.

YU (T. F.) & FANG (C. T.). **A preliminary report on further studies of physiologic specialization in Ustilago hordei.**—*Phytopathology*, xxxv, 7, pp. 517–520, 1945.

Most of the 84 collections of covered smut (*Ustilago hordei*), obtained chiefly from south-western China [*R.A.M.*, xxii, p. 427], were inoculated from 1941 to 1943 into 14 barley varieties, of which four were selected as differential hosts, namely, Nanking Nos. 368 and 373, Himalaya (C.I. 1312), and Excelsior (C.I. 1248). On this basis nine physiologic races of the pathogen were recognized and designated by the numbers 1 to 9. The two predominant races were 1 and 2, of

which the former is the weakest of all in pathogenicity, not only the four differential varieties, but the rest of those inoculated being resistant to it, while Himalaya and the two Nankings are likewise resistant to race 2 and Excelsior intermediate in its response.

BEVER (W. M.). **Hybridization and genetics in Ustilago hordei and U. nigra.**—*J. agric. Res.*, lxxi, 2, pp. 41–59, 4 figs., 1945.

The production of new physiologic races from interspecific and intraspecific hybridization of *Ustilago nigra* and *U. hordei* is described [*R.A.M.*, xxii, p. 351; xxiv, p. 143]. The temperature requirements for germination of the two species and of two F_2 hybrids between them were similar, the optimum ranging from 24° to 28° C. Chlamydospores of *U. hordei* showed up to 50 per cent. germination at 36°, whereas those of *U. nigra* failed to germinate at that temperature. *U. hordei* hybridized readily with *U. nigra* as shown by sporidial fusion in culture and hybrid chlamydospore formation in the host. Interspecific and back-crosses failed to show simple Mendelian inheritance of chlamydospore markings, pathogenicity, and type of smutted head. The smutted heads produced from a monosporidial interspecific cross ranged in the F_1 from those closely resembling *U. nigra* to the *U. hordei* type. Whereas back-crosses of the interspecific hybrids on the *U. hordei* parent tended to yield heads of the *U. hordei* type, most of the interspecific hybrids on the *U. nigra* parent gave rise to all types of heads. In the F_2 of the interspecific hybrid some correlation was observed between chlamydospore markings and type of smutted head, the *U. nigra* type usually having echinulate spores and those of the *U. hordei* type smooth or echinulate with roughly equal frequency.

The interspecific hybrid *U. hordei* H6 × *U. nigra* N6 proved pathogenic to the three test varieties Nepal, Lion, and Himalaya, although *U. hordei* H6 attacked only Lion. Similarly, the intraspecific hybrid *U. nigra* N4 × *U. nigra* N6 attacked all three varieties, whereas *U. nigra* N4 attacked only Lion. Hence both hybrids differed from their parents in degree of pathogenicity. In the F_2 both hybrids tended to combine pathogenic characters rather like the F_1, except that the F_2 of the interspecific hybrid produced more smutted heads on Himalaya than either of its parents. It is apparent that new physiologic races may result from hybridization between the two species studied. The fact that some heads smutted by the interspecific hybrid contained only smooth chlamydospores, while others showed only echinulate ones, suggests that the inbred races of *U. hordei* and *U. nigra* used in the experiments were phenotypically pure.

ARNY (D. C.). **Physiologic specialization in Helminthosporium gramineum Rabh.**—*Phytopathology*, xxxv, 7, pp. 571–572, 1945.

Recently a culture of barley stripe (*Helminthosporium gramineum*) pathogenic to the Atlas variety, which is normally resistant to the disease in Wisconsin [*R.A.M.*, xxiii, p. 479] though susceptible in California [ibid., xxii, p. 473], was isolated from a spontaneously infected plant at the Agricultural Experiment Station of the former State. It was designated G.H.A 2 and tested on Oderbrucker (C.I. 4666), Colsess IV (C.I. 5979), and three lots of Atlas, of which one (Wisconsin) had been included in the State breeding programme for a number of years, the second (California) was supplied by C. A. Suneson, and the third (C.I. 4118) was grown by R. G. Shands at the Wisconsin Agricultural Experiment Station in 1942. Two other cultures of *H. gramineum*, C–1 and 45–2, both of Wisconsin origin, were used for comparative purposes.

Atlas from all three sources responded similarly to inoculation, being resistant to C–1 and 45–2 but susceptible to G.H.A 2 (average infection on Wisconsin 3, 3, and 72 per cent., respectively, on California 0, 59, and 0, and on C.I. 4118 0, 92, and 0). Oderbrucker was susceptible to C–1 and 45–2 (86 and 97 per cent.,

respectively), but highly resistant to G.H.A 2 (1 per cent.), while Colsess was severely attacked by all three (87, 100, and 80 per cent.) respectively. The new culture is thus pathogenically distinct from the other two.

MOORE (M. B.), HAYES (H. K.), & STAKMAN (E. C.). **The field reactions of certain Oats hybrids and varieties to stem rust.**—*Phytopathology*, xxxv, 7, pp. 549–551, 1 fig., 1945.

Selected lines from crosses made from 1930 to 1933 at the Minnesota Agricultural Experiment Station between Bond oats and each of the varieties Rainbow, Iogold, Anthony, Double Cross A, and Double Cross B (Minota × White Russian) × Black Mesdag were consistently resistant to stem rust (*Puccinia graminis avenae*) until 1943, when nearly all the lines from Bond × Rainbow and Bond × Iogold bore a liberal sprinkling of large pustules besides the usual number of small ones, the former indicating the presence of races pathogenic to these varieties. The Vicland and Tama varieties also showed both types of pustules. Race 8 was exclusively isolated in the greenhouse from all the nine collections from lines or varieties with Rainbow, Iogold, or Richland parentage (Tama and Vicland from the last-named), while three out of four from Anthony or Double Cross yielded only race 2, the remaining one producing 2 and 8 in the proportions of 70 and 30 per cent., respectively.

These observations are briefly discussed in the light of recent studies on physiologic specialization in oats stem rust, including those of Stakman and Loegering [*R.A.M.*, xxiii, p. 433], demonstrating the extensive increase of race 8 in 1943.

STANTON (T. R.). **Registration of varieties and strains of Oats, XIV.**—*J. Amer. Soc. Agron.*, xxxvii, 8, pp. 643–644, 1945.

Mission (C.I. 2588), Reg. No. 104, originating from a cross between Markton and Victory oats made at Aberdeen, Idaho, in 1923, approved for registration in 1944 [cf. *R.A.M.*, xxii, p. 299], is a medium-tall, early to mid-season variety with spreading panicles, relatively stiff straw, and plump, white kernels, which has shown a high degree of resistance to the races of loose and covered smuts [*Ustilago avenae* and *U. kolleri*] occurring in Montana.

ALTSTATT (G. E.). **A new Corn disease in the Rio Grande Valley.**—*Plant Dis. Reptr*, xxix, 20, pp. 533–534, 1945. [Mimeographed.]

An apparently new maize disease, possibly of a virus nature and characterized by the stunted, bushy appearance of affected plants with chlorotic, green- and white-striped leaves, and pronounced broad bronze and red bands extending along the whole length of the leaf, has been engaging the attention of plant pathologists in the Rio Grande Valley, Texas. It is highly prevalent in the Weslaco-Donna area, the percentage of plants affected in commercial fields varying from 0 to 30, and well-known varieties of field, sweet, and popcorn were attacked. A further consistent symptom of the disease is the growth of an elongated ear shoot, often exhibiting as many as five nodes, from each of the lower nodes of the plant, and each shoot may produce two to three vestigial or poorly developed ears. Some plants affected may produce a normal full ear, but later ears may be incompletely developed, with poorly filled kernels. In some cases there is no emergence of silk, the tips of the husks become dry, and in sweet maize particularly, the flag leaves on the ear are much longer in proportion to the length of the ear, and usually narrower, than those on healthy ears. The angle between these leaves and the ear is also wider. There is no evidence of internal breakdown, cavities or discoloration in the stalk, though the basal tip sometimes shows necrosis. The roots are usually sound. Research is continuing with a view to determining the exact nature of this disease.

SAHA (J. C.) & BHATTACHARJEE (S. K.). **Artificial production of ergot in the tropical plains of Bengal.**—*Nature, Lond.*, clvi, 3960, pp. 363–364, 1 fig., 1945.

In an experiment carried out at Calcutta, four small plots were sown with rye and sprayed at flowering with a conidial suspension of *C[laviceps] purpurea*, obtained by culturing pieces of ergot from a commercial source. Good infection of individual rye flowers occurred on all plots, the sclerotia maturing seven to nine weeks after the first spraying. From 1 to 33 (commonly 3 to 6) of these organs were present on each panicle, the largest measuring 3·6 by 0·4 cm. and weighing 0·248 gm. when air-dried. The sclerotia were hand-picked, and after six weeks' storage at room temperature (20° to 25° C.) were sent in glass bottles for assay. The report received stated that the ergots were of good quality, with total alkaloid and ergometrine contents of about 320 and 72 mg. per 100 gm., respectively [cf. *R.A.M.*, xxiii, p. 382]. This result demonstrates that very good ergot can easily be produced artificially in the plains of the tropics.

JOHANN (HELEN) & DICKSON (A. D.). **A soluble substance in Cornstalks that retards growth of Diplodia zeae in culture.**—*J. agric. Res.*, lxxi, 3, pp. 89–110, 14 figs., 1945.

Maize plants are usually resistant to stalk rot caused by *Diplodia zeae* during the vegetative period of their growth. Susceptibility increases after pollination and the disease is seldom noticeable until the milk stage has been reached and the kernels have become dented. These facts have led the authors to seek evidence of physiological resistance to stalk rot in an ether- or sap-soluble substance in the stalks of yellow dent maize, and they present in this paper the results of experiments conducted during the years 1935 to 1940.

The ether extracts of 11 inbred lines and 5 hybrids collected before or shortly after pollination usually delayed the development of the fungus to a greater degree than extracts drawn from stalks at a later period of growth. Some lines retained more of the growth-retarding substance throughout the maturation period than others, suggesting a physiological type of resistance not necessarily associated with strength of stalk or morphological characters.

The growth of *Gibberella zeae* and *Nigrospora sphaerica* was similarly inhibited to some extent by the ether extract, but *G. fujikuroi* showed little susceptibility to it. The growth-retarding substance was stable to heat and slightly soluble in water, and removal of the ears did not increase this property, or clipping of the leaves lower it.

Expressed juice of the stalks contained a growth-retarding substance that showed seasonal change and differed in the lines tested as did the ether extracts. After the time of pollination, the capacity to retard growth grew less, noticeably in the case of susceptible tissue. The chemical nature of the substance is not known, but it is suggested that the differences exhibited in the physiological resistance of the various lines may be caused by differences in timing and in the speed with which lines pass through the various stages of their development, rather than by fundamental differences in the general trend of the curve of susceptibility.

STANDEN (J. H.). **Nigrospora oryzae (B. and Br.) Petch on Maize.**—*Phytopathology*, xxxv, 7, pp. 552–564, 2 figs., 1 graph, 1945.

The following conclusions are drawn from the author's investigations at the Iowa Agricultural Experiment Station on the ear rot of maize caused by *Nigrospora oryzae* [*R.A.M.*, xxiii, p. 339]. Poorly-matured tissues were more susceptible to infection than well-matured ones. Single crosses (236 in all) were separated on the basis of visual inspection into three groups, i.e., poorly- and well-matured and prematurely dying, numbering 66, 101, and 69, respectively, the incidence of infection in which was 6·8, 4·9, and 19·7 per cent., respectively. Lodging, stalk and

root rot, and early frosts were all contributory factors in an increased incidence of ear infection, which was also high in secondary ears and axillary shoots on account of their poor maturity. Such material probably affords a principal source of inoculum for the following season.

The relation between the P_H of the cob and the amount of infection, previously observed by Reddy [ibid., xiii, p. 299], depended on the lowering of the cob P_H as the ear matured. In cobs maturing poorly or still immature at the onset of frost, the P_H remained high. Late-maturing inbreds were heavily infected in years of early frost and remained healthy when frost was delayed. Green tissues did not contract the disease.

In many ears the fungus failed to spread beyond the incipient stage of infection, its further growth being apparently conditioned by moisture, temperature, and cob maturity. The retting of cob tissues, a characteristic field symptom, was produced in the laboratory on insufficiently matured samples only. Chaffiness of the ears, another feature of the disease, is probably also a concomitant of the incomplete maturity predisposing to attack by *N. oryzae*.

MOERDYK (J. L.). **Division of Agriculture.**—*Rep. vet. agric. Dep. Swaziland, 1944*, pp. 13–19, [1945. Mimeographed.]

Information received from H. Hutchinson stated that late plantings of maize at the White Umbuluzi farm, Swaziland, were severely attacked by streak [*R.A.M.*, xxiii, p. 296], and yielded only about two bags per acre, as against a general average of six. Seed of a resistant hybrid of the Peruvian and Hickory King varieties from Barberton gave a crop notably free from the disease, even though planting was not until March. The seed is being multiplied for distribution.

ARENTSEN (S.). **Estudio de la susceptibilidad presentada por diversas especies y variedades de Citrus al ataque de Phytophthora citrophthora (Sm. & Sm.) Leon.** [Study of the susceptibility to attack by *Phytophthora citrophthora* (Sm. & Sm.) Leon. of certain species and varieties of Citrus.]—*Agric. tec. Chile* (formerly *Bol. Sanid. veg. Chile*), ii, 1, pp. 54–58, 1945.

Inoculum from a pure culture of *Phytophthora citrophthora* [*R.A.M.*, xxii, p. 477], isolated by Fawcett and Bitancourt in 1937 from fallen fruit of bitter oranges found in Misiones Province, Argentina, was introduced into the bark of citrus trees through holes made by a blunt instrument. The resultant lesions varied considerably in size among the different species, the areas affected on lemon, Persian lime, citrangequat [Willits citrange (= *Poncirus trifoliata* × common orange) × oval kumquat (*Fortunella margarita*)], Satsuma orange [*Citrus nobilis* var. *unshiu*], and grapefruit being 183·3, 59, 56·5, 56, and 55 (54·2 in another test) sq. cm., respectively. Variations also occurred among varieties of the same species (Villafranca, Eureka, and Ponderosa varieties of lemon) and even in individual fruits of the same variety (of which the Persian lime fruit was an outstanding example), without it being possible to determine any significant difference in the relative susceptibility of trunks and branches. In general, the results of the experiment confirmed those obtained by Klotz and Fawcett in 1930 [ibid., ix, p. 303] and Fawcett and Bitancourt [ibid., xx, p. 400], and demonstrate the susceptibility of the lemon to *P. citrophthora*.

CASS SMITH (W. P.). **A note on the occurrence of Sclerotinia twig blight of Oranges.**—*J. Dep. agric. W. Aust.*, xxii, 1, pp. 77–80, 2 figs., 1945.

The author believes that this is the first occasion on which *Sclerotinia sclerotiorum* has been noted on the woody parts of citrus [*R.A.M.*, xxiii, p. 481] in Western Australia, although the fungus has a wide host range, and is frequently active in cold weather, in this and other parts of the Commonwealth [ibid., xxi, p. 440]. Infection took place at injuries due to frost on the twigs of orange trees in an

orchard at Brookhampton, and the symptoms exhibited were similar to those described as characteristic by Fawcett, including the shredded fibrous condition, which distinguishes it from a similar trouble caused by *Botrytis cinerea*. The source of the infection is thought to be the orchard cover crop in view of the frequency with which winter cover crops are attacked by this pathogen. Excision and burning of infected twigs and the deep burial of the orchard cover crop, if also infected, is recommended. Spraying with Bordeaux mixture prior to the winter rains may give some protection.

FAWCETT (H. S.). **Chemical treatment for scaly bark of Citrus.**—*Calif. Citrogr.*, xxx, 11, p. 340, 1 fig., 1945.

The author describes a chemical method of treating psorosis bark lesions early so as to prolong the commercial usefulness of citrus trees [*R.A.M.*, xxiii, p. 340]. One per cent. solution of dinitro-ortho-cyclohexylphenol in paraffin is applied with a brush to the lesion itself, and to the bark surface 6 in. above and below and 3 in. on either side. Before applying the solution, loose scales should be rubbed off with a wire brush or heavy leather glove, care being taken not to injure the live bark. Every precaution must be taken not to let the liquid run down the trunk, as it may cause the death of the bark right through to the wood. Thus, no part of the bark should receive more solution than is needed to wet it from one stroke of the brush, and brushes with very coarse bristles should not be used, as the liquid is likely to run too rapidly from them. Properly applied, dinitro-ortho-cyclohexylphenol solution penetrates and kills only the lesioned, outer bark and the cambium is able to build a new bark. The solution should be applied preferably during the months of April, May, and June, and September and October should be avoided. Each tree in an orchard should be inspected once a year in order to discover lesions as soon as they occur. Treatment at a later stage when the top has begun to deteriorate is useless.

The solution, known as DN–75, is prepared and distributed by the Dow Chemical Company.

WALLACE (J. M.). **Technique for hastening foliage symptoms of psorosis of Citrus.**—*Phytopathology*, xxxv, 7, pp. 535–541, 2 figs., 1945.

At the Citrus Experiment Station, Riverside, California, the inoculation of sweet orange (mostly Homosassa) seedlings with a basal trunk diameter as small as 5 mm. has greatly expedited the development of the foliar symptoms of psorosis [*R.A.M.*, xxiii, p. 61]. Small bark patches from diseased trees are placed against the cambium below strips of bark peeled back on the trees to be inoculated. Callus is rapidly formed and the virus transmitted. The small stock trees are topped to within 2 or 3 in. of the bark patch.

Symptoms either of the severe-shock or young-leaf stippling and blotching type usually appear on the growth arising from the upper axillary buds after topping. Inoculated trees reacting by severe-shock symptoms during the first flush of growth commonly show only the typical young-leaf features of psorosis in the later flushes. If the bark patches used for inoculum are taken directly from the lesion areas, the infected stocks develop bark and mature-leaf symptoms early, often within two months, and undergo a permanent set-back to growth.

An inoculation procedure lessening the time required for symptom development in psorosis-affected orange trees is of value in the acceleration of transmission studies, while other uses are (1) as an adjunct to, and possibly after further development as a substitute for, the regular inspection of trees proposed as bud-wood parents and the field tests on their progeny; and (2) as a means for the positive substantiation of the presence of psorosis in suspected trees yielding no reliable evidence of infection in the field.

BHAT (S. S.). **The die-back disease of Citrus trees.**—*Indian Fmg*, vi, 6, pp. 250–253, 1945.

In this paper the washing down of surface soil by irrigation and natural precipitation to subsoil layers, where it packs hard and prevents drainage, is seen as a possible cause of the malnutrition of citrus trees and consequent onset of die-back disease in the Indo-Ganges and Gujarat Valleys [*R.A.M.*, viii, p. 442], where the flat riparian countryside also impedes lateral drainage, although the soil itself is favourable to citrus cultivation. Other causes of citrus malnutrition appear to be associated with the physical and chemical composition of soils, and the author commends to Indian plant pathologists the methods of soil deficiency diagnosis developed at the East Malling Research Station. Manuring of citrus plantations is backward in India. Mosambi and other citrus trees in the Punjab and Gujarat have responded well to spraying by zinc and iron sulphates. Budding delicate citrus varieties on resistant jamburi stocks and rigorous selection of root stock seedlings are also essential measures of die-back control. Plantations should be made on carefully selected soils of reasonable elevation, and salty and 'kalar' patches and soils with high lime content should be avoided.

RUDOLPH (B. A.) & HARRISON (G. J.). **The invasion of the internal structure of Cotton seed by certain Fusaria.**—*Phytopathology*, xxxv, 7, pp. 542–548, 1945.

In the course of the writers' studies in California on the role of cotton seed in the dissemination of *Verticillium albo-atrum* [*R.A.M.*, xxiv, p. 99], several species of *Fusarium* were isolated from apparently healthy seed, which must have harboured the species internally since delinting with acid precluded the possibility of survival on the exterior. In 1935 8·19 per cent. of the placentae in bolls from plants infected with *Verticillium* wilt yielded *Fusarium* and in 1936 7·37 per cent., though the plants showed no sign of disease except that they were more or less stunted. Seed from bolls with receptacles yielding *Fusarium* in culture was delinted and planted in the field on soil not known to have borne cotton crops before. Isolations from the steles of such plants showed 25 per cent. infection with *Fusarium* as against 19·81 per cent. for plants raised from so-called healthy seed, which evidently shows that *Fusarium* was present in much of that seed when planted.

The *Fusarium* spp. reach the seed by way of the xylem, which they presumably occupy as saprophytes, since the plants display no pathological symptoms of any kind. The species so far identified are *F. moniliforme* [*Gibberella fujikuroi*], *F. oxysporum*, and *F. scirpi*, of which the last-named is capable of inducing a soft, brown rot of immature seeds.

VASUDEVA (R. S.). **Studies on the root-rot diseases of Cotton in the Punjab. XIII. Leaf temperatures of healthy and root-rot affected plants.**—*Indian J. agric. Sci.*, xiv, 6, pp. 385–388, 1944.

After stating that root rot [*Corticium solani* and *Macrophomina phaseoli*: *R.A.M.*, xxiii, p. 484] is the most serious disease of cotton in the Punjab, where it causes heavy damage every year, the author describes experiments in which the leaf temperatures of healthy and affected plants were recorded by the thermo-electric method. The results obtained [which are tabulated] showed that affected plants remain considerably warmer than healthy ones. For example, the temperatures of the inner leaf tissues of healthy and diseased plants were (in one of six tests) 30·62° and 31·09° C., respectively at 6.30 a.m., 32·95° and 36·10° at 9 a.m., 37·81 and 39·28° at noon, and 38·18 and 38·83 at 5 p.m.

Preliminary work also showed that the transpiration rate is much higher in healthy than in affected plants. The increase in temperature of diseased plants is probably due to defective root absorption.

PRASAD (N.). **Studies on the root-rot of Cotton in Sind. II. Relation of root-rot of Cotton with root-rot of other crops.**—*Indian J. agric. Sci.*, xiv, 6, pp. 388–391, 1944.

In Sind, cotton root rot is caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *Fusarium caeruleum* [*R.A.M.*, xxiv, p. 228 and cf. preceding abstract], singly or together. Other crops attacked by root rot include castor (*Ricinus communis*), sesame (*Sesamum orientale*), sunn-hemp (*Crotalaria juncea*), and guar (*Cyamopsis psoraloides*), and experiments were accordingly carried out to determine the cause of the disease in these hosts.

Affected roots of castor, sunn-hemp, sesame, and guar were collected at different times from different places in Sind, and isolations made from them at regular intervals. The isolates that most frequently appeared were *Fusarium* and *Rhizoctonia*. Cultures of *Rhizoctonia* from these four hosts and cotton were used to inoculate seedlings of all these, and were found to be pathogenic. Isolations were made from the inoculated plants and the cultures obtained were found in almost all cases to be identical with the cultures used for the inoculations. It is therefore evident that the rot in all these crops is caused by *Rhizoctonia* and that the fungus isolated from the rotted roots is pathologically the same in all cases. Similar experiments were carried out with the *Fusarium*, with the same results. The organisms were identified as *R. bataticola* [*M. phaseoli*] and *F. caeruleum*, respectively. The latter showed aerial mycelium and bluish-green sporodochia in all cultures while sclerotia were absent; only in the isolate from sesame was there a concentration of spores on the surface resembling pionnotes. Terminal chlamydospores were produced in abundance by each isolate on practically every medium and intercalary chlamydospores on potato and steamed rice. The conidial measurements on 2 per cent. potato dextrose agar were as follows: 0-septate 6 to 15 by 3 to 6 μ; 1-septate 9 to 20 by 3 to 6 μ; 2-septate 13 to 33 by 3 to 7 μ; and 3-septate 25 to 40 by 3 to 7 μ.

HEIM (R.). **Études descriptives et expérimentales sur les Agarics termitophiles d'Afrique tropicale.** [Descriptive and experimental studies on the termitophile Agarics of tropical Africa.]—*Mém. Acad. Sci., Paris*, lxiv, 74 pp., 10 pl. (1 col.), 1941. [Received September, 1945.]

This is a full description and critical discussion, in the light of relevant contemporary literature, of the author's studies on the Agaricaceae of tropical African termites' nests [*R.A.M.*, xxii, p. 333 and next abstracts], which he regards as constituting an entirely distinct section of the family in respect of their physiognomic, anatomical, cytological, biological, cultural, and biochemical characters. To accommodate these fungi a new genus, *Termitomyces* [with a diagnosis in French only], is erected, of which one group of three forms, including a new species, *T. mammiformis*, is comprised in the present memoir.

HEIM (R.). **Nouvelles études descriptives sur les Agarics termitophiles d'Afrique tropicale.** [New descriptive studies on the termitophile Agarics of tropical Africa.]—*Arch. Mus. Hist. nat. Paris*, Sér. 6, xviii, pp. 107–166, 4 pl. (1 col.), 19 figs., 1942. [Received September, 1945.]

Included in this further instalment of the author's investigations on the Agaricaceae of tropical African termites' nests [see preceding and next abstracts] are six species of *Termitomyces*, two newly described and two new transfers to that genus. A dichotomous key to the species and varieties of *Termitomyces* and three other synoptical tables are given, besides notes on *Marasmius pahouinensis* de Seynes and two chromosporous species of *Lepiota* saprophytically associated with termites' nests. Latin diagnoses of the new genus and species are given.

HEIM (R.). **Les champignons des termitières. Nouveaux aspects d'un problème de biologie et de systématique générales.** [The fungi of termites' nests. New aspects of a problem of general biology and taxonomy.]—*Rev. sci., Paris*, lxxx, 2, pp. 69–86, 22 figs., 1942. [Received September, 1945.]

This is a summary of the essential results of the author's studies on the biology and taxonomy of the *Termitomyces* associated with termites' nests in tropical Africa [see preceding abstracts].

COUCH (J. N.). **Revision of the genus Coelomomyces, parasitic in insect larvae.**—*J. Elisha Mitchell sci. Soc.*, lxi, 1–2, pp. 124–136, 2 pl., 1945.

After an historical review of the genus *Coelomomyces* [*R.A.M.*, xxiii, p. 16], with a résumé of the species hitherto known, the author describes five new species from Georgia, this being the first report of this genus from the Western Hemisphere. The new species are *C. dodgei* on *Anopheles crucians* and other species of *Anopheles*, *C. psorophorae* on *Psorophora ciliata*, *C. quadrangulata* on *Anopheles* spp., *C. pentangulata* on *Culex erraticus*, and *C. uranotaeniae* on *Uranotaenia sapphirina*. The author's observations confirmed the view that the mycelium lacks cell walls. The resting sporangia, their dehiscence, and the structure of the zoospore suggest a relationship with the Blastocladiales, but because of the naked mycelial threads and the obligate parasitism in insect larvae, the author places these fungi in a new family, the Coelomomycetaceae, in the Blastocladiales.

KARLING (J. S.). **Brazilian Chytrids. VI. Rhopalophlyctis and Chytriomyces, two new chitinophyllic operculate genera.**—*Amer. J. Bot.*, xxxii, 7, pp. 362–369, 61 figs., 1945.

Pursuing his studies of the Chytrids of Brazil [*R.A.M.*, xxiv, p. 313], the author reports two new monocentric operculate genera, *Rhopalophlyctis* and *Chytriomyces*, and three new species, *R. sarcoptoides*, *C. aureus*, and *C. hyalinus*, first found on skeletons of unidentified insects in fresh water in the Amazon Valley and later collected in abundance on the exuviae of mayflies in Connecticut, New York, and Virginia.

DE SALLES (J. F.) & HATHAWAY (C. R.). **Nota sôbre a infestação de Musco domestica Linneu, 1758, por um Ficomiceto do gênero Empusa.** [Note on an infestation of *Musca domestica* Linnaeus, 1758, by a Phycomycete of the genus *Empusa*.]—*Mem. Inst. Osw. Cruz*, xli, 1, pp. 95–99, 4 figs., 1944. [English summary.]

The authors record an outbreak of disease among house flies in Rio de Janeiro, Brazil, caused by *Empusa muscae* [*R.A.M.*, xxi, p. 45], with brief notes on the fungus.

ARNY (A. C.). **Registration of improved Flax varieties, III.**—*J. Amer. Soc. Agron.*, xxxvii, 8, pp. 646–648, 1945.

Three blue-flowered varieties of flax, Arrow (C.I. 1070), Renew (C.I. 839), and Koto (C.I. 842), Registered Nos. 5, 6, and 7, respectively, were approved for registration in 1944 [cf. *R.A.M.*, xxiii, p. 63]. Arrow, a selection from a Bison × Renew cross made at Bozeman, Montana, in 1938, has been found to be immune from the North American races of rust (*Melampsora lini*) and equally resistant with the Bison parent to wilt (*Fusarium lini*) and 'pasmo' (*Sphaerella linorum*). It is recommended for seed production in Montana.

Renew is a selection from the cross Newland × (Reserve × Monje) made at Mandan, North Dakota, in 1930. It is immune from rust, moderately resistant to wilt, and susceptible to 'pasmo'. It is recommended for seed production in North Dakota and Montana.

Koto, another North Dakota selection from the cross (Reserve × Monje) × Bison, is susceptible to rust and similar in wilt and 'pasmo' reaction to the Bison parent. It is on the list of recommended varieties for Minnesota and the Dakotas.

MILLIKAN (C. R.). **Wilt disease of Flax.**—*J. Dep. Agric. Vict.*, xliii, 7, pp. 305–313, 9 figs.; 8, pp. 354–361, 5 figs., 1945.

Successive outbreaks of flax wilt (*Fusarium lini*) have occurred in Victoria in recent years. The disease in the past has often been attributed to over-cropping [*R.A.M.*, viii, p. 795], and the severe outbreaks in the Drouin district during 1941, 1943, and 1944 are stated to have occurred on overcropped land. Flax sickness has been attributed to various fungi other than *F. lini*, but it is clear that this species is the primary cause of that disease also [ibid., xx, p. 18]. In countries like Victoria, where the disease appears very late in the season, the only symptom may be a premature ripening. The critical temperatures for the development of wilt are closely parallel with those for the causal organism. Greenhouse experiments show that susceptible plants growing in naturally infected soil may escape the disease if the soil temperature is 55° F. or below. When transferred to a tank with the temperature maintained at 75°, severe infection developed in two to three weeks, 100 per cent. of the plants being infected in the case of the Concurrent variety and 50 in that of Bison.

In field experiments from 1942 to 1944 inclusive, the soil temperatures were very favourable for wilt infection in January to March and from October to December, and high percentages of infected plants occurred in sowings during these months. From May to September (most of the flax in Victoria is sown in late May or June), temperatures were below the minimum for infection and the plants showed no sign of wilt until the middle of October, after which they developed severe infection. The occurrence of wilt, therefore, is solely dependent on the prevailing soil temperature and the age of the plant has little effect on the final severity.

Flax varieties to be tested for resistance were grown at a temperature of 75° in Burnley temperature tanks in 'wilty' Drouin soil, the infection of which was considerably increased by a preliminary sowing of the susceptible Concurrent variety. In these circumstances up to 100 per cent. wilt infection was obtained within 20 days of germination. The surface of the pots was divided into two or four equal sections, and Concurrent seed sown in one section for control purposes. Where the soil had not been built up by a preliminary sowing of Concurrent, many varieties included in the susceptible class developed less wilt, but resistance tended to break down after several sowings in 'wilty' soil. This may have been due to depletion of plant nutrients in the soil, concerning the influence of which in encouraging wilt disease there is little information. The old soil was then replaced after two tests only by fresh, 'wilty', steam-sterilized soil, which was inoculated with pure cultures of *F. lini* and the inoculum built up by one or two sowings of Concurrent. As a result, the percentage of infection recorded was often higher than when the same varieties were grown in naturally infected soil. Less than 40 per cent. infection was shown by Argentine 868, Newland × (19 × 112) C.I. 839, Ottawa 770B × Buda C.I. 1073, Saginaw × Bombay C.I. 671, and Russian × Argentine C.I. 896. The last-named, which is also immune from *Melampsora lini* [ibid., xxiii, p. 437], has been selected as the foundation stock for a flax-breeding policy designed to produce wilt- and rust-resistant varieties suitable for conditions in Victoria. Russian × Argentine C.I. 896, tested for wilt reaction with Concurrent and Liral Crown varieties, in naturally infected soil in the field in a normal winter sowing, was free from infection 150 days after germination, whereas Concurrent showed 99·8 and Liral Crown 100 per cent.

In experiments on the selection of wilt-resistant strains of flax, Liral Crown, Liral Prince, Royal, and J.W.S. selections all exhibited a superior wilt reaction to the parent plant in temperature-tank tests, particularly the Royal selection. The Liral Crown and Liral Prince selections also showed high resistance in the field, the former in both winter and summer sowings and the latter in a winter sowing.

A Victoria strain (D1) of *F. lini* has been compared with two strains from New Zealand and one from Minnesota in temperature-tank tests and found to be distinct. The need for testing new flax varieties to as many races of *F. lini* as possible before release is therefore clearly demonstrated.

WHITE (N. H.). **The relation of Polyspora lini Lafferty and Pullularia pullulans (de Bary) Berkh. to Flax browning.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 2, pp. 141–149, 1945.

During 1942 and 1943 both the author and H. R. Angell observed browning of flax crops in Tasmania, though no stem-break was present. From affected material the author isolated *Pullularia pullulans*, which closely resembled isolates of *Polyspora lini* [*R.A.M.*, xxi, p. 334] from other countries. Platings from diseased stems showed five dominant fungi, viz., *Pullularia*, *Fusarium*, *Cladosporium*, *Alternaria*, and *Phoma*. Flax seed of different origins, including crops affected with browning, was tested for germination and for seed-borne organisms by the Ulster method. Germination in pots was about the same for all sources. No acervuli or other structures resembling those described by Lafferty were found on any of the tissues or seeds examined. The only fungus found on the diseased flax that resembled *Polyspora lini* was *Pullularia pullulans*, the essential points of resemblance being the production of slimy radula spores with a yeast-like budding process.

When two cultures of *Pullularia pullulans* (P1 and P2) from Canberra and Tasmania and four of *Polyspora lini* (P5, P6, P8, and P9) from two places in Victoria, New Zealand, and Ireland were compared, it was not found possible satisfactorily to distinguish them on a basis of microscopic structure, cultural, serological, and physiological characters, capacity to ret flax [cf. ibid., xxi, p. 370], or pathogenicity to flax. Two (P8 and P9) were distinguishable from P1, P2, P5, and P6 on a basis of sprout-cell size and shape and of the waxy-pink colour developed on potato slopes as against the dirty buff shown by the last four, but P5 and P6, which had been identified as *P. lini*, had characters that corresponded with P1 and P2, which were identified as *Pullularia pullulans*. Again, P8 and P9, though possessing sprout-cells of the same shape, differed significantly in sprout-cell size. The only basis for differentiation would seem to be the shape of the sprout-cells and the thallus colour. On this basis, P8 and P9 (both *Polyspora lini*) would be one group and the other four (two *Pullularia pullulans* and two *Polyspora lini*) another. The similarity of all the other characters, however, and the serological compatibility of all six cultures would suggest that they are generically identical. Thus, *P. lini* is considered really to be a *Pullularia*, and the sole specific difference found in this work is the sprout-cell shape and colony colour on potato slope. It is suggested that it might be referred to as *P. pullulans* var. *lini*.

If *Polyspora* and *Pullularia* are identical, their association with flax browning must be secondary. The suggestion is made that browning symptoms may develop as a result of attack by the *Pullularia*, which develops on the flax together with associated fungi when the plant is adversely affected by environmental conditions. The author's failure to obtain any pathogenicity reaction on flax suggest that a very special set of environmental conditions may be necessary to induce browning.

It is pointed out that, in spite of seed treatments, browning has been reported as occurring in areas that never produced flax before: this supports the probable

identity of *Polyspora* and *Pullularia*, and the latter being ubiquitous, seed treatment would be useless. In the present work, *Pullularia* was found to occur at about the same rate on seed from both healthy and diseased crops. The beneficial effect of seed treatment on germination in Petri dish cultures would appear to result from the removal of saprophytes. *Pullularia* was also found to be inimical to the germination of grass and peas, and mycelium of the fungus in the seed coats of grass and peas was ascertained to be non-pathogenic.

ANGELL (H. R.). **Browning of Flax and excess soil moisture.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 2, pp. 150–152, 1945.

In March, 1943, the author investigated the prevalence of a flax disease apparently indistinguishable from browning [see preceding abstract] in Tasmania. As the condition was general over 250 acres of peaty soil in five different fields and was not observed in any other fields sown with seed from the same source, it appeared to be, probably, due to some adverse soil condition. In December of the same year it was present in two fields near Calac, Victoria. It had also been observed at Canberra, A.C.T., in 1942. Plantings from the roots of the Canberra plants gave only saprophytes.

In an experiment made outdoors at Canberra, with over 200 4-gal. drums sown with Liral Crown on 14th to 15th August, 1944, and subjected to various treatments, symptoms of browning developed on 15th November on the upper part of one plant in a waterlogged drum. The water on the surface of the soil in this and other waterlogged drums was at once drained off, and from that time until harvesting a normal amount was supplied. The plants in every drum in which the soil had been waterlogged in turn developed browning. The most conspicuous feature was the general browning and dying of individual plants during the flowering and fruiting season. Only in one other drum did a few plants show browning; in this, the soil-level was well below the brim; and this had, apparently, led to overwatering. There was little difference between the fibre obtained from the controls and the waterlogged plants.

After the results of this experiment were known, the author observed that browning also began in the field after the excess soil water had disappeared. It should not, however, be assumed from this work that the disease is always associated with excess soil water. The physical and chemical composition of the soil appear to exercise a controlling influence.

So far, browning has occurred in only a few fields in Australia, and whether or not it is of economic importance is doubtful. The available evidence suggests that if a crop is otherwise satisfactory it should not be degraded because of browning.

MACHACEK (J. E.) & BROWN (A. M.). **Threshing-injury to Flax seed in Canada.**—*Sci. Agric.*, xxv, 10, pp. 601–625, 4 figs., 1925.

The results of more detailed, but often somewhat inconclusive, experiments on the prevalence and effects of threshing injury to flax seed in Canada, suggest to the authors of this paper that the crop losses resulting from it are less severe than indicated by earlier investigations [*R.A.M.*, xxii, p. 98]. Dry weather makes seed brittle and, while it never cracks when hand-threshed or passed through rubber rollers, more or less severe fracturing occurs when it is treated by machines equipped with a steel threshing cylinder. Flax seed of relatively high water content is in consequence less brittle and, being also protected to some extent by the spongy material from moist bolls, is less susceptible to injury. This is probably why threshing injury seems less prevalent in eastern than in western Canada, where the average of cracked seed during the years 1940 to 1943 was over 40 per cent. Large-seeded varieties seem more liable to damage than those with small seeds.

Fractured kernels, planted in ordinary soil, are subject to attack by soil-borne micro-organisms. These attacks are usually more serious in heavy soils than in light, but variations in soil temperature do not appear to affect the frequency of infection. It was noticed that rotting of fractured kernels under field conditions was less severe than in greenhouse experiments. Though seed treatment, notably with 1½ oz. ceresan per bush. on heavy soils, improved the germination of fractured seed, improved yields did not always result, and while uninjured field-sown seed germinated better than fractured kernels, there was often nothing to choose between the yields. Overdoses of disinfectants retarded germination and the seedlings often showed enlarged cotyledonary leaves and sometimes no others. Damaged seed was not only liable to further injury from disinfectants, but the ill effects of this were observed also in the seedlings. An effect of sowing seed, whose germinating capacity had been improved by disinfection, at the normal rate of seeding practised, was that more plants than could be adequately nourished were produced and the yield consequently was not likely to prove any greater than from poorer and untreated seed sown at the same rate.

DA SILVA FERNANDES (C.). **O rolamento do broto do Sisal (Agave sisalana Perrine).** [Sisal (*Agave sisalana* Perrine) bud roll.]—*Bol. S.A.I.C.*, xi, 1–2, pp. 60–63, 10 figs., 1944.

Sisal in the State of Parahyba, north-eastern Brazil, suffers from a deficiency of potassium, expressed as leaf basal necrosis as described by Medina [*R.A.M.*, xxiii, p. 487], and from calcium deficiency [rolamento] manifested by a complete severance of the leaves near their base, almost invariably at right angles to the cone formed by the leaves of the bud. The surfaces exposed by this process present a blackened appearance corresponding to an intense suberization of the severed tissues. The proximal ends remain healthy and continue to develop to a normal size, while from the centre of the circle formed by the transverse truncation of the bud arise perfect new leaves. The disturbance, however, appreciably retards the growth of the plant, and the procurement of fibre from the broken distal portions is impracticable or uneconomic. The symptoms appear to reach a climax some time after the first sharp showers following a hot, protracted summer. There is no reason to believe that the disorder, which also affects henequen (*Agave fourcroides*), is of parasitic origin.

FRICK (LOUISE). **Untersuchungen über die Biologie und Pathogenität von Diplocarpon rosae (Lib.) Wolf.** [Studies on the biology and pathogenicity of *Diplocarpon rosae* (Lib.) Wolf.]—*Phytopath. Z.*, xiv, 6, pp. 525–591, 2 pl., 13 figs., 1 diag., 5 graphs, 1943. [Received September, 1945.]

Evidence is adduced for the recognition of the rose black-spot fungus, *Diplocarpon rosae* [*R.A.M.*, xi, p. 792; xiii, p. 771; *et passim*] in Switzerland as early as 1894. Hitherto little attention has been paid to its occurrence on wild roses, among which the author found the following species affected: *Rosa arvensis*, *R. canina*, *R. glauca*, *R. pomifera*, *R. eglanteria*, *R. elliptica*, *R. dumetorum*, *R. hemitricha*, *R. thuilleri*, *R. uriensis* [*R. glauca*], *R. vogesiaca*, and *R. foetida*.

The organism is a facultative parasite, the hyphae of which spread through the subcuticular tissues of the host, as well as intercellularly in the interior of the living leaves and intracellularly in the saprophytic phase. The black colour of the foliar lesions is attributable to the dark shade of the subcuticular hyphae and of the disorganized host cells. The bicellular, hyaline, oblong to clavate conidia produced during the summer in the subcuticular acervuli measure (average of three isolates) 15·5 to 16·9 by 4·6 to 5·4 μ, the corresponding dimensions for those developing during the winter in the subepidermal pycnidia in dead leaves being 17·2 to 19·2 by 4·8 to 5·8 μ. The subcuticular acervuli of the summer phase

further give rise during the autumn to unicellular, hyaline, bacteroid microconidia, 2·5 to 4·5 by 1 to 2 μ, which are abstricted from bicellular conidiophores superficially resembling macroconidia, but narrower, shorter, and not constricted at the septum.

Summer and winter conidia from rose leaves and malt agar cultures germinated in the same manner, in hanging drops, each conidium producing up to five germ-tubes. The minimum, optimum, and maximum temperatures for the process were found to be 0°, 18°, and 33° C. Only 2 per cent. of the conidia collected on diseased leaves on 6th March, 1942, germinated compared with 97 per cent. of those dating from 2nd May, the corresponding figures for 1st June, 6th July, 17th August, and 12th and 30th October being 87, 26, 31, 43, and 70, respectively. Three- and six-day-old conidia germinated to the extent of 92 and 88 per cent., respectively, while from 9 to 27 days the figure dropped from 71 to 6, and by the 31st day viability was altogether lost. A synthetic auxin, 'Roche 202', was shown to stimulate germination. On leaves of the W. E. Chaplin variety, the germination process differed in certain features from that in hanging drops, beginning later (after 18 compared with 9 hours) and only one short germ-tube being normally produced. The single germ-tube penetrates the intact cuticle or occasionally (on the under side) enters the leaf through the stomata.

In Switzerland, and apparently in other European countries, the fungus occurs exclusively in the conidial phase, *Marssonina rosae*, also known as *Actinonema rosae* [ibid., iv, p. 672], the connexion between which and *D. rosae* was demonstrated by Wolf (*Bot. Gaz.*, liv, pp. 218–234, 1912). Overwintering is effected by means of the saprophytic mycelium, and re-infection in the spring takes place mostly from the dead leaves strewn over the soil, the conidia produced at this season in the subepidermal pycnidia being splashed by rain on to the young basal leaves.

Under uniform environmental conditions *D. rosae* infects both leaf surfaces with equal severity, but further growth is better on the upper than on the lower side. Young leaves are more rapidly and virulently attacked than old ones, and one- and two-year-old seedlings are more susceptible than plants of several years old. Very young leaves are protected from infection by a coating of wax. In inoculation experiments with 12 isolates of the fungus on two cultivated varieties, W. E. Chaplin and Etoile de Hollande, and seven wild species, one isolate proved to be non-pathogenic; otherwise there were no indications of physiologic specialization. Varying reactions to infection, however, were shown by the wild roses, *R. cinnamomea* and *R. pendulina* being entirely and *R. arvensis* virtually immune while *R. foetida* was the most susceptible, followed by *R. eglanteria*, *R. glauca*, and *R. pomifera* in the order given. Negative results were obtained in inoculation tests on Rosaceae other than the rose.

The fungus rapidly loses its pathogenicity in pure culture; after seven months three isolates from wild roses caused no infection on Etoile de Hollande and only a low percentage (maximum of 7·9) on W. E. Chaplin after five weeks' incubation. The same two varieties contracted 33·7 to 44·3 and 43·6 to 49·8 per cent. infection, respectively, when inoculated with fresh summer conidia. *D. rosae* grows very slowly, 15 to 37 days elapsing before the incipient mycelium could be discerned, and the diameter of the colonies after a month ranging from 2 to 9 mm. However, among 18 isolates studied (13 from cultivated and 5 from wild roses), the differences in the mycelial growth rate were apparent, the diameters varying between 3·9 (Betty Uprichard) and 15·7 mm. (Mrs. Sam McGredy). The temperature relations of the various isolates were identical, the minimum, optimum, and maximum for development being 0°, 21°, and 30°. The slight disparities in the individual means of the conidial dimensions of isolates from 16 cultivated and 10 wild roses failed to provide a basis for separation into morphological races.

The problems connected with control by breeding for resistance [*R.A.M.*, xix, p. 540] and chemical treatments [ibid., xxiv, p. 103] are briefly discussed.

COCHRANE (V. W.). **The effect of artificial light on germination of urediospores of Phragmidium mucronatum (Fr.) Schlecht.**—*Phytopathology*, xxxv, 6, pp. 458–462, 1945.

Under artificial light from 1,250-ft. candles, both the germination rate and final germination of rose rust (*Phragmidium mucronatum*) uredospores [*R.A.M.*, xxiv, p. 417] were depressed, the germination percentages after three, six, and 24 hours at 19·5° to 20° C. being 7, 28·6, and 42·2, respectively, as against 85, 92·9, and 93·7, respectively, for the unilluminated controls. A test of germination in darkness of previously illuminated spores showed that only 21 per cent. were viable after 24 hours' exposure to light. The apparently lethal effects of strong light may, however, be only indirect. Spores prevented from germination by light, but otherwise uninjured, may have lost their viability through the leaching of soluble cell constituents into the agar medium. Unpublished data showed that spores on agar rapidly lose their viability if prevented from germinating by low temperatures; in one test, 24 hours' storage of spores on agar at 3° resulted in a decline of viability from 91·1 to 25·4 per cent. The subsequent germinability of dry spores was not impaired by 24 hours' exposure to light of an intensity of 1,250-ft. candles. In this connexion it may be noted that the intensity of natural light at mid-day in summer often reaches the value of 10,000–12,000-ft. candles. Illumination from 200-ft. candles caused only slight temporary delay of germination, while light of low intensity (2·4-ft. candles) exerted no effect on the process.

SMITH (K. M.). **Dahlias and the problem of virus infection.**—*Gdnrs' Chron.*, Ser. 3, cxviii, 3066, pp. 140–141, 2 figs., 1945.

Notes are given on the symptoms and control of three viruses affecting the *Dahlia* in England, viz., tomato spotted wilt, cucumber mosaic, and *Dahlia* mosaic. The first-named produces well-defined rings on some varieties, such as Brentwood Bedder, but on others the symptoms are somewhat indeterminate, though a ring-like tendency is apparent. The cucumber mosaic virus has only recently been isolated from *Dahlia* plants at the Plant Virus Research Station, Cambridge. The leaves bear mottled, pale and dark green patches, without blistering, accompanied in some varieties by green whorls or ring-and-line patterns distinct from the clear-cut, concentric rings typical of spotted wilt. Yet other varieties, such as Bishop of Llandaff, serve as symptomless carriers of the virus. Unlike the two foregoing viruses, with their numerous hosts, the *Dahlia* mosaic virus is apparently confined to the one genus. Rings do not develop on the leaves, which show a yellowish-green banding of the veins. Some varieties show foliar distortion and blistering and there is a tendency for the lateral shoots to be shortened, producing bushy, stunted plants. Control of the viruses should be based on the suppression of aphids and thrips by spraying, dusting, or fumigation with nicotine, and the building-up of healthy nucleus stocks, which should be isolated in a special glasshouse and regularly rogued.

HOLLOWELL (E. A.). **Registration of varieties and strains of Alfalfa, I.**—*J. Amer. Soc. Agron.*, xxxii, 8, pp. 649–652, 1945.

Ranger (*M[edicago] media*), a synthetic lucerne variety (Reg. No. 1) originated and developed at the Colorado and Nebraska Agricultural Experiment Stations, respectively, is resistant to bacterial wilt (*Corynebacterium insidiosum*) and winter-hardy. At the Iowa Agricultural Experiment Station in 1943, when stand reductions were caused by the disease, Ranger yielded 3·55 tons of hay per acre,

compared with 2·47, 3·47, 1·75, and 3·01 for Grimm, Hardistan, Kansas Common, and Ladak, respectively.

Buffalo (Reg. No. 2) is a highly wilt-resistant, purple-flowered selection from Kansas Common developed at the Kansas Agricultural Experiment Station.

Meeker Baltic (Reg. No. 3), a natural selection from Baltic, is susceptible to wilt and therefore adapted for cultivation in the northern and central States where the disease is not a limiting factor.

BLACK (L. M.). **A virus tumor disease of plants.**—*Amer. J. Bot.*, xxxii, 7, pp. 408–415, 9 figs., 1945.

Pursuing his investigations into the host range and symptomatology of the new plant virus, *Aureogenus magnivena* [*R.A.M.*, xxiii, p. 490], for which the name 'wound-tumour virus' (causing 'wound-tumour disease') is now suggested as an alternative to 'clover big-vein virus', the author describes experiments which show the pathogenicity of the virus, isolated from *Agallia constricta* leaf-hoppers, to 43 suscepts from ornamental, vegetable, and common weed plants, the following species proving notably easy to infect: *Brachycome iberidifolia*, *Chrysanthemum leucanthemum* var. *pinnatifidum*, *Melilotus alba*, *Trifolium incarnatum*, *Rumex acetosa*, *Linaria maroccana*, and *Schizanthus wisetonensis*.

In the wound-tumour disease the presence of the virus is manifested not by the more usual symptom of the 'clearing of the veins', but by an enlargement of the veins on the lower surface of the leaf, frequently accompanied by the depression of the vein below the upper surface of the lamina, and giving rise to either enations, as exemplified by observations on *Vinca rosea*, *T. incarnatum*, and *Lobelia erinus*, where they are large with nodular basal clusters, or to vein-tumours which protrude on the under side of leaves through the green surface tissues to expose the white tumour tissue, as exhibited in the cases of *R. acetosa* and *C. leucanthemum*. Diseased leaves commonly show various kinds of distortion, dwarfing, and curling, the tops of the plants being severely stunted in many instances. *M. alba* alone showed tumours both on stems and roots, while the leaves showed no symptoms other than slight dwarfing. The response of individual representatives of a species to infection, as in the case of *R. acetosa*, often varies considerably.

The tumours produced by the virus on the roots of many suscepts are characterized by overgrowths tending to become spherical and woody. According to the species of suscepts, the size ranges up to 1 cm. in diameter and on some roots were so numerous that they became fused together. Other species showed only scattered tumours, while in yet others a cluster of tumours appeared on a single lateral root. In one species the root tumours were a deep purple, although the normal root was almost white. It seemed that a definite connexion existed between the root tumours and the emergence points of the lateral roots. Tumours were also produced on the crown of certain hosts and on the petioles of others. Wound-tumour disease resembles Fiji disease of sugar-cane [ibid., xiii, p. 539]; possibly wallaby ear-disease of maize [ibid., xxi, p. 484]; in some respects crown gall (*Bacterium tumefaciens*); and may be related to curly top of beets in Argentina. The author believes that further study of the pathogen will throw more light on the virus causation of plant tumours.

FISCHER (G. W.). **The mode of infection and the incubation period in the stem smut of grasses, Ustilago spegazzinii (U. hypodytes).**—*Phytopathology*, xxxv, 7, pp. 525–532, 1945.

In inoculations with spore suspensions of *Ustilago spegazzinii* and its var. *agrestis* (*U. hypodytes*) [*R.A.M.*, xxiv, p. 420] from several species of *Agropyron* and *Elymus*

at the Washington Agricultural Experiment Station, positive results were obtained only on mature plants of *A. cristatum*, *A. trachycaulum*, and *E. canadensis*, seed and blossom tests being unsuccessful. Infection probably takes place through the meristematic tissues but the minimum incubation period was two years, a trace of stem smut developing in the second heading after inoculation and becoming abundant in the third. *A. repens*, one of the hosts from which the inoculum for the above-mentioned experiments was procured, is believed to constitute the source of the common local outbreaks of the disease. Once established in a stand of a susceptible species, *U. spegazzinii* tends to increase rapidly year after year, denoting that spread occurs from plant to plant. The most practicable method of control will probably consist in the use of resistant strains of forage grasses, but owing to the lengthy incubation period of smut it is unlikely to appear until three years after planting or, under normal conditions, to limit production to any extent for two or three years more, i.e., five or six from the time of planting.

SPRAGUE (R.) & JOHNSON (A. G.). **Selenophoma on grasses. II.**—*Mycologia*, xxxvii, 5, pp. 638–639, 1945.

The genus *Selenophoma* is emended by the authors to include species with somewhat obtusely pointed spores, other characters being concordant. *S. obtusa* is described as a new species with conidiophores measuring 40 to 150×40 to 138 μ and conidia 13 to 17×2·5 to 4·2 μ. It is found on living leaves and culms of various *Sitanion*, *Stipa*, *Poa*, *Elymus*, and *Agropyron* grasses in the western United States. *Phyllosticta stomaticola* is renamed *Selenophoma donacis* var. *stomaticola* (Baüml.) n. comb. and *Septoria everhartii* becomes *Selenophoma everhartii* (Sacc. & Syd.) n. comb.

OLIVE (L. S.). **A new Dacryomyces-like parasite of Arundinaria.**—*Mycologia*, xxxvii, 5, pp. 543–552, 35 figs., 1945.

Specimens of a leaf parasite of *Arundinaria tecta*, representing a new genus and species to which it is proposed to give the name *Dicellomyces gloeosporus*, were received at the United States Department of Agriculture from Georgia and North Carolina. The fungus causes small, yellow spots which enlarge and become dark brown, usually with a surrounding yellow zone. Small, yellow fructifications appear on the lower surface of the spots and eventually large portions of the leaves may become brownish and dead. The young sporocarp originates within the leaf and ruptures the epidermis. The fungus resembles *Dacryomyces* in colour, form of fructification, gelatinous nature, 2-sterigmate basidia, and allantoid basidiospores (8·6 to 11·9 by 2·7 to 4·5 μ), which may become septate and frequently bud out globose conidia. The persistent probasidia, basidia produced externally to the gelatinous matrix, and relatively short sterigmata distinguish this parasite from all other genera of the Dacryomycetaceae.

Union of South Africa Proclamations Nos. 116 and 117, 1945. Restriction on the introduction of certain plants into the Union. Portions and products of certain plants included in the definition of plant.—2 pp., Govt. Printer, Pretoria, 1945.

These Proclamations, dated 28th and 25th May, 1945, respectively, introduce amendments into the Schedule to Proclamation No. 286 of 1936 [*R.A.M.*, xvi, p. 640] involving the prohibition of importation into the Union of South Africa of seeds, plants, logs, or unmanufactured timber of any species of elm or *Zelkova* from countries harbouring the Dutch elm disease (*Ceratostomella ulmi*). The restriction likewise applies to articles made from these woods, e.g., packing-cases or barrels, on which bark is present.

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